FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:—

1926

Sept. 10-18	**Two-Seater Light Aeroplane Competition, Lympne.**
Sept. 12	**Race Meeting at Prague.**
Sept. 18	**Grosvenor Challenge Cup, at Lympne.**
Oct.	**Schneider Cup Race at Norfolk, Virginia, U.S.A.**
Oct.	**Stefanik Prize Race at Prague.**
Oct. 24-28	**Coppa del Mare, Italy.**
Nov. 11-15	**Coppa d'Italia, Italy.**
Nov.-Dec.	**Paris Aero Show.**

EDITORIAL COMMENT.

On the Right Track

IN several ways the race meeting held at Bournemouth on Saturday and Sunday last deserves a place among the milestones of British post-war aviation. It is true the meeting could in no way rival an Aerial Derby with extremely high-speed machines competing for the "blue ribbon" of the air. The thrill of enormous speed was lacking. But the meeting did prove that our light 'planes are capable of excellent sport. When the light 'plane movement first commenced some years ago we ventured to express the opinion that this type of machine might be the means of reviving the Brooklands and Hendon atmosphere of old, the relatively low speed and general handiness of the light 'plane making it possible to hold races "around the sticks" as used to be the custom at Hendon before the war, and thus afford the spectators a much more intimate view of the races than is possible with modern projectiles which have to be flown high and cannot be got around the sharp corners of a course confined within the limits of an aerodrome. We think it can justly be claimed that the Bournemouth meeting proved this contention to be correct, for although competing machines did go somewhat outside the confines of the comparatively small aerodrome represented by the Ensbury Park racecourse, they were in sight practically throughout, except for a few moments when particularly daring competitors did a bit of "hedge-hopping." In consequence, visitors were able to follow quite closely the progress of each race, which naturally added enormously to the interest.

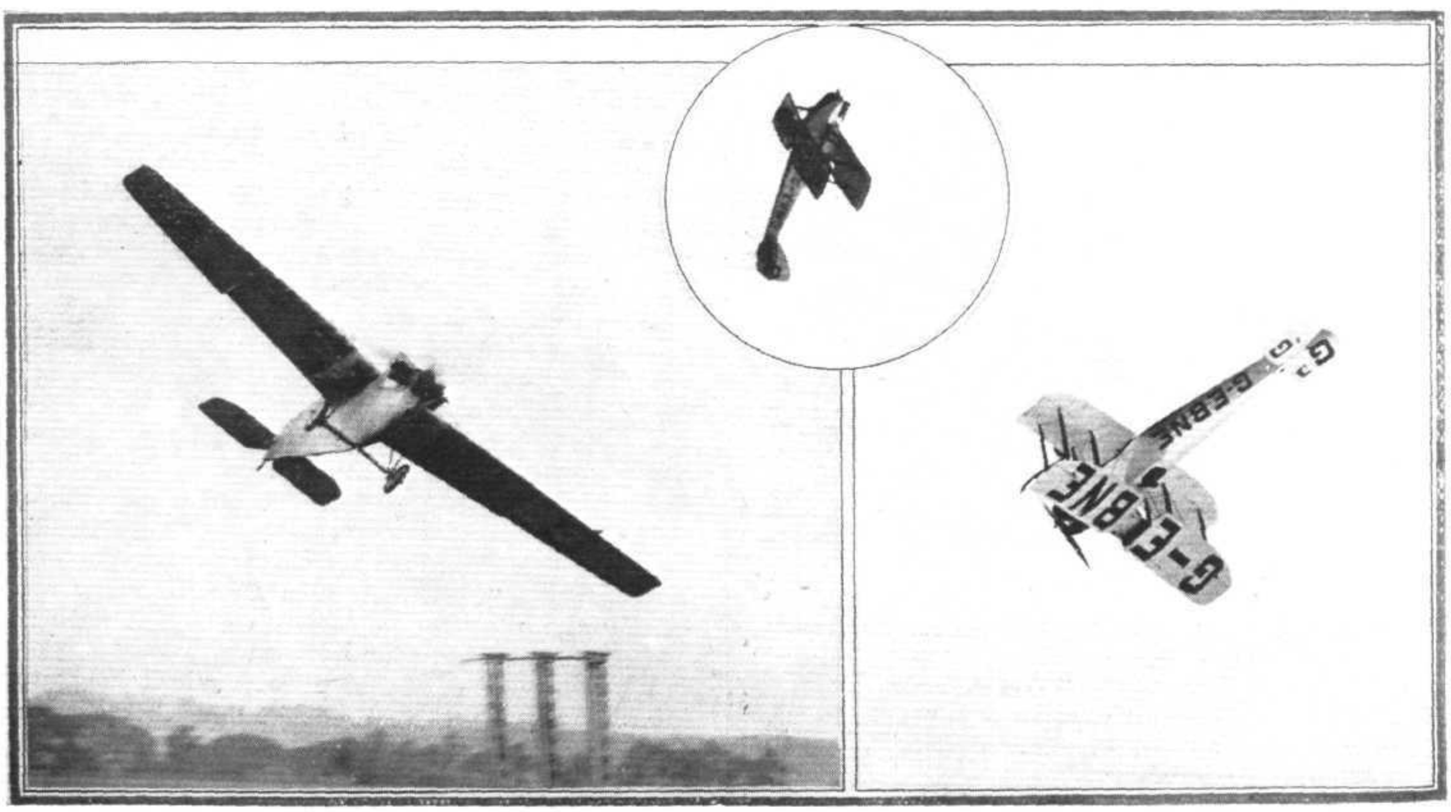
We think that what assisted particularly in creating interest in the races was the fact that a large percentage of them were scratch races for machines of the "Moth" type. We have repeatedly pointed out in these columns that a handicap race in which there is a very great difference between the speeds of the limit and scratch man is not likely to be very exciting, while races between "one-design" machines, in which everything depends upon the skill of the pilot

and on getting the last ounce of power out of the engine are much more impressive. This was proved at Bournemouth, and now that we have a reasonable number of "Moths" in existence, with every probability that the number will steadily increase, we do feel that this form of air racing should be encouraged in every way possible. The holding of the Lympne meeting next month will probably preclude such a meeting being held at one of the London aerodromes in the near future, but we trust that the Royal Aero Club will be able to organise a light 'plane meeting somewhat on these lines shortly after the conclusion of Lympne week.

What is the Matter?

It is impossible to watch without a certain amount of misgiving the alarming series of accidents that have occurred recently in the Royal Air Force, and the question which naturally arises is whether all these regrettable losses of lives are in every instance unavoidable. We think it may be assumed that in a large percentage of cases the primary cause can be ascribed to the personal element, *i.e.*, to some form or other of "error of judgment." Stalls near the ground are probably responsible for a great number of crashes, and a number of other mistakes which may or may not have fatal consequences are very easily made, all mistakes which come under the heading "error of judgment." The prevalent mistake, the stall, can be largely counteracted by fitting some such device as the Savage-Bramson anti-stall gear, although there may be reasons why this device is less suitable in a single-seater fighter than in commercial machines. It is, however, to the matter of training that one must primarily look for the prevention of making mistakes, and the exceptional number of accidents recently seems to point to the desirability of a searching review of our training methods. It may be that in the system in force there are not sufficient intermediate steps between the school machine and the high-power, high-speed service machine. We say it may be: we do not say it is. But, at any rate, it would seem that the subject might bear looking into.

Then there is the question of the structural strength of our fastest machines. It is no use denying the fact that during the last year or so several structural failures have occurred, and it is well known that the Americans, with much greater experience of high-speed aircraft, are now insisting on considerably higher load factors than demanded in this country. It is true that the fitting of parachutes, now, fortunately, becoming much more general in the R.A.F., minimises to some extent the dangers due to structural failure, but there is at least one recent case on record in which the pilot is reported to have been unable to get clear of his machine, possibly on account of the very high speed attained. The Air Ministry—and the Air Ministry only—is in possession of all the facts, and it is therefore to the Air Ministry that we must look for an explanation of the reasons for these regrettable accidents. Outsiders can do nothing except ask for an assurance that everything possible is being done to get at the root of the trouble and to find a remedy. We are aware that no young man likely to enter the Royal Air Force will funk a certain amount of risk, but the rate at which accidents have occurred recently is such that it might well give an exaggerated idea of the dangers of service flying, and might thus deter from joining the service many young men of the type it is most desired to attract.



["FLIGHT" *Photographs*

"SIDE AND UP-SIDE" LINES AT THE BOURNEMOUTH AVIATION MEETING: Left, Flt.-Lieut. J. S. Chick making a test flight on the R.A.E. "Hurricane" (Bristol "Cherub"). Right, Bert Hinkler takes a good look at the ground from the Avro "Gosport" before landing after an exhibition flight. Inset, Capt. H. S. Broad makes a roll on the red-and-white King's Cup "Moth."

THE BOURNEMOUTH SUMMER AVIATION RACE MEETING

On Saturday and Sunday last Bournemouth held its first real Aviation Race Meeting—apart, of course, from the Schneider Cup Contest—since the historic meeting of 1910. Organised under the competition rules of the Royal Aero Club, this Bournemouth Summer Aviation Race Meeting was held at the Ensbury Park Racecourse, situated at the north-west end of Bournemouth, and was undoubtedly a successful and enjoyable affair. It must be admitted that we expected to see a much larger attendance, considering the size of Bournemouth and its population (residential and otherwise), especialy at the present time. However, some 5,000 attended on Saturday, and another couple of thousand or so must be added to this for Sunday's crowd.

Ensbury Park is an excellent little racecourse, and it could, we think, be made to serve equally well as a medium-sized aerodrome for future meetings. On Saturday and Sunday, however, it only just managed to serve this purpose, for on several occasions some of the higher-powered and faster machines experienced some trouble in landing. Even a "Moth" occasionally had to "try again"—however, the two days' programme was got through without a single serious mishap to man or mount, and, after all, it was the first meeting of its kind to be held on the course, and actually we think one or two minor "improvements" would set matters aright.

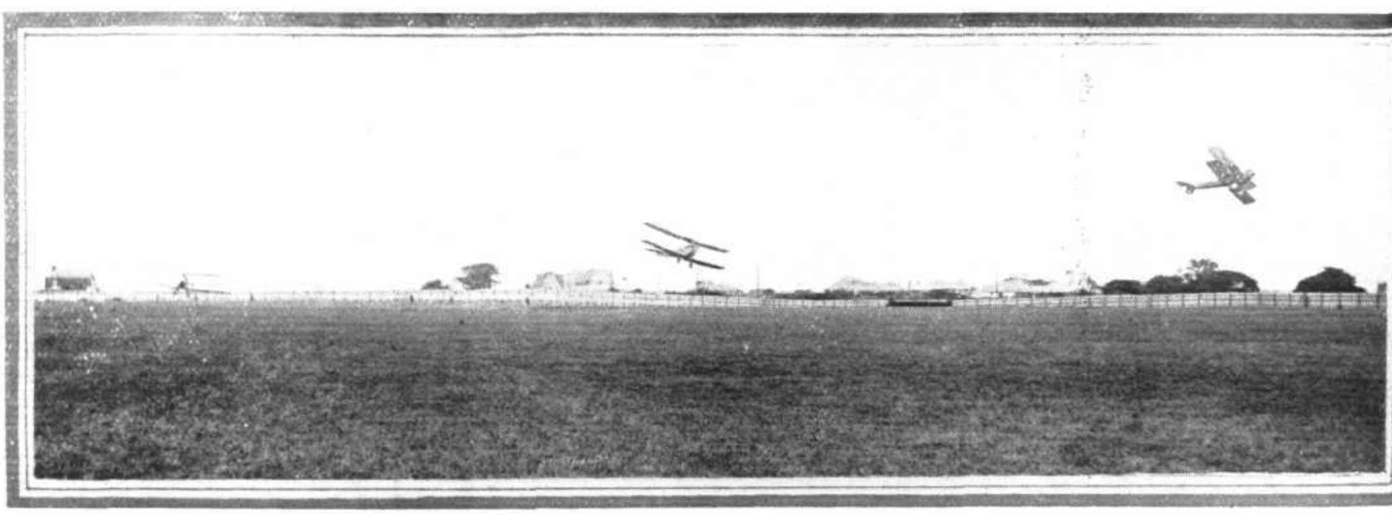
A glance through the programme—sorry, "Official Race Card"—disclosed many events for each day, the various races having a good number of entries, of which latter D.H. "Moths" formed an overwhelming majority. In fact, we heard it suggested that the name of this popular seaside resort should be changed to "Bournemoth."

Saturday's first event, which commenced promptly at 2 p.m., was the Light Aeroplane Club Instructor's Scratch Race, open to standard D.H. "Moths" (1st prize, £20; 2nd prize, £10). The course—which was the same for all the racing events—was over a triangular circuit of about 5 miles, flown over twice, and during which the competitors were in view practically the whole time. Being almost broadside on after the first turning point (East Parley), one was able to follow their respective positions and overtakings until No. 2 turning point (Kinson Manor Farm), after which they flew "head on" to No. 3, a white cross on the 'drome. The finish was flown along the "straight" of the racecourse, past the grand stands and judge's box, offering a splendid and close view of the machines as they hurtled past.

There were four entries for this event, as follows:—(1) GEBLT, Midland Ae.C., Capt. W. J. McDonough. (2) GEBLI, London Ae.C., Capt. F. G. M. Sparks. (3) GEBNY, London Ae.C., S. L. F. St. Barbe. (4) GEBOH, Hants Ae. C., Capt. G. I. Thomson.

["Flight" Photograph

THE BOURNEMOUTH AVIATION MEETING: General view of a corner of Ensbury Park Racecourse which was used as a machine park. Behind will be seen the portion reserved for motor cars.



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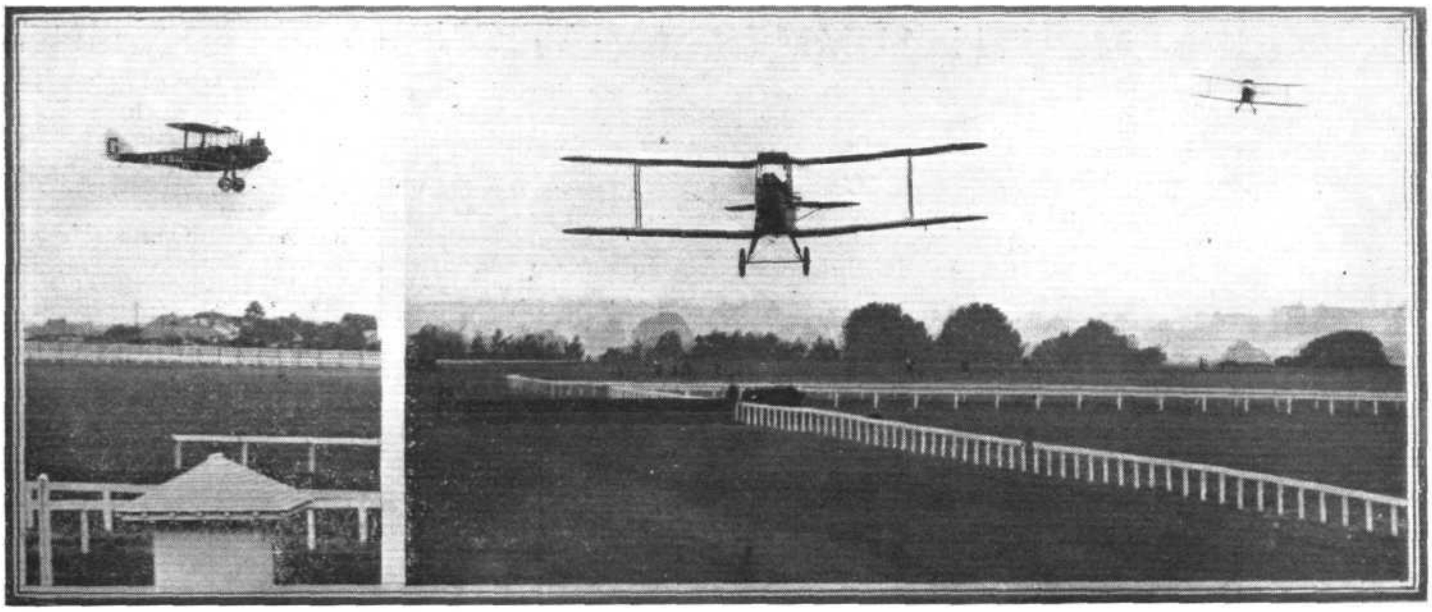
THE BOURNEMOUTH AVIATION MEETING: Three of the four D.H. "Moths" take off for the first event on Saturday—the Light Aeroplane Club Instructors' Scratch Race. The leading machine is one of the L.Ae.C. entries, then McDonough on the Midland Ae. C. 'bus, and finally Capt. G. I. Thomson (Hants Ae. C.).

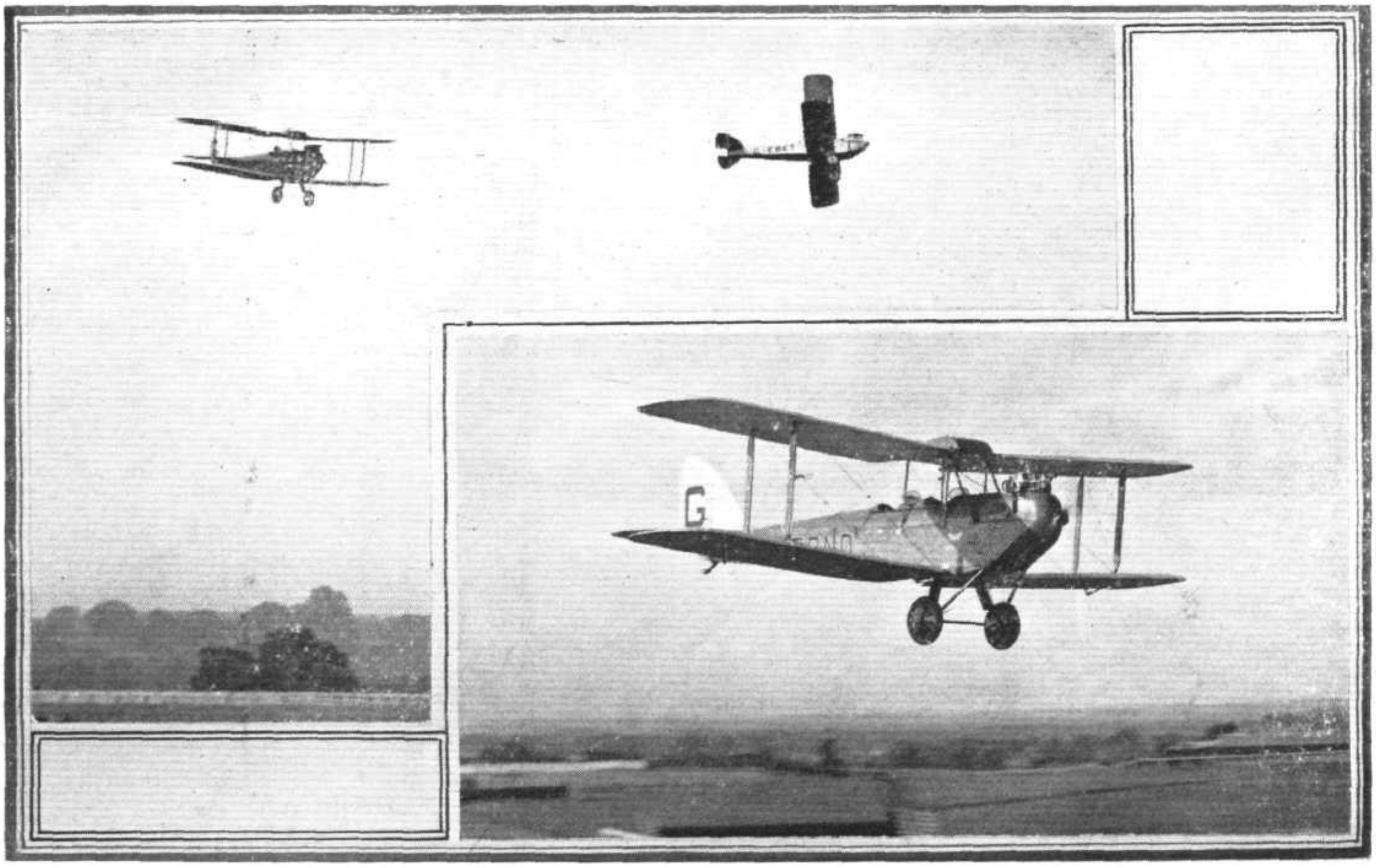


[" FLIGHT " *Photographs*

THE BOURNEMOUTH AVIATION MEETING : The Christchurch Sprint Scratch Race (Saturday). On the left, W. L. Hope wins the second heat of this event, and is thus able to (right) win the final, on his D.H. "Moth." Sparks, however, on the L.Ae.C. " Moth," is, it will be seen, a good second.

At the start weather conditions were by no means ideal, there being a strong and gusty S.W. wind blowing and a plentiful supply of rain clouds, so that it was observed that the four " Moths " were not having a particularly easy time of it. All four machines got away together, Sparks making a smart turn into the course, and thus obtaining the lead, which he maintained throughout. He thus came in an easy winner, with McDonough second, St. Barbe third, and Thomson fourth.

Although there were seven entries for the next event, the Boscombe High Power Handicap (open to all aeroplanes with engines of 100 h.p. or over), there were only three starters —Wing.-Com. Sholto Douglas, on his Avro 120 h.p. Airdisco, Bert Hinkler, on A. V. Roe and Co.'s Avro " Gosport " (100 h.p. Mono-Gnome), and A. S. Butler on his D.H. 37/100 h.p. Nimbus. The non-starters were C. D. Barnard's S.E.C.M. (split " prop "), D. A. N. Watt's " Grasshopper " (non-arrival) and " Swallow," and Mrs. Eliott-Lynn's S.E.5A. The course was over two laps as before, and Butler's D.H.37 GEBDO, although the last to start, overhauled the others on the end of the last lap, and came in first, with Sholto Douglas (GEBKN) second, and Hinkler (GEBNE) third.



[" FLIGHT " *Photographs*

THE BOURNEMOUTH AVIATION MEETING : The Ensbury Park Low Power Handicap (Saturday). Top, Mrs. Eliott-Lynn (right) and S. L. F. St. Barbe flying their " Moths," in the first heat. Bottom, Capt. de Havilland on his Cirrus II " Moth," winning the final of this race.

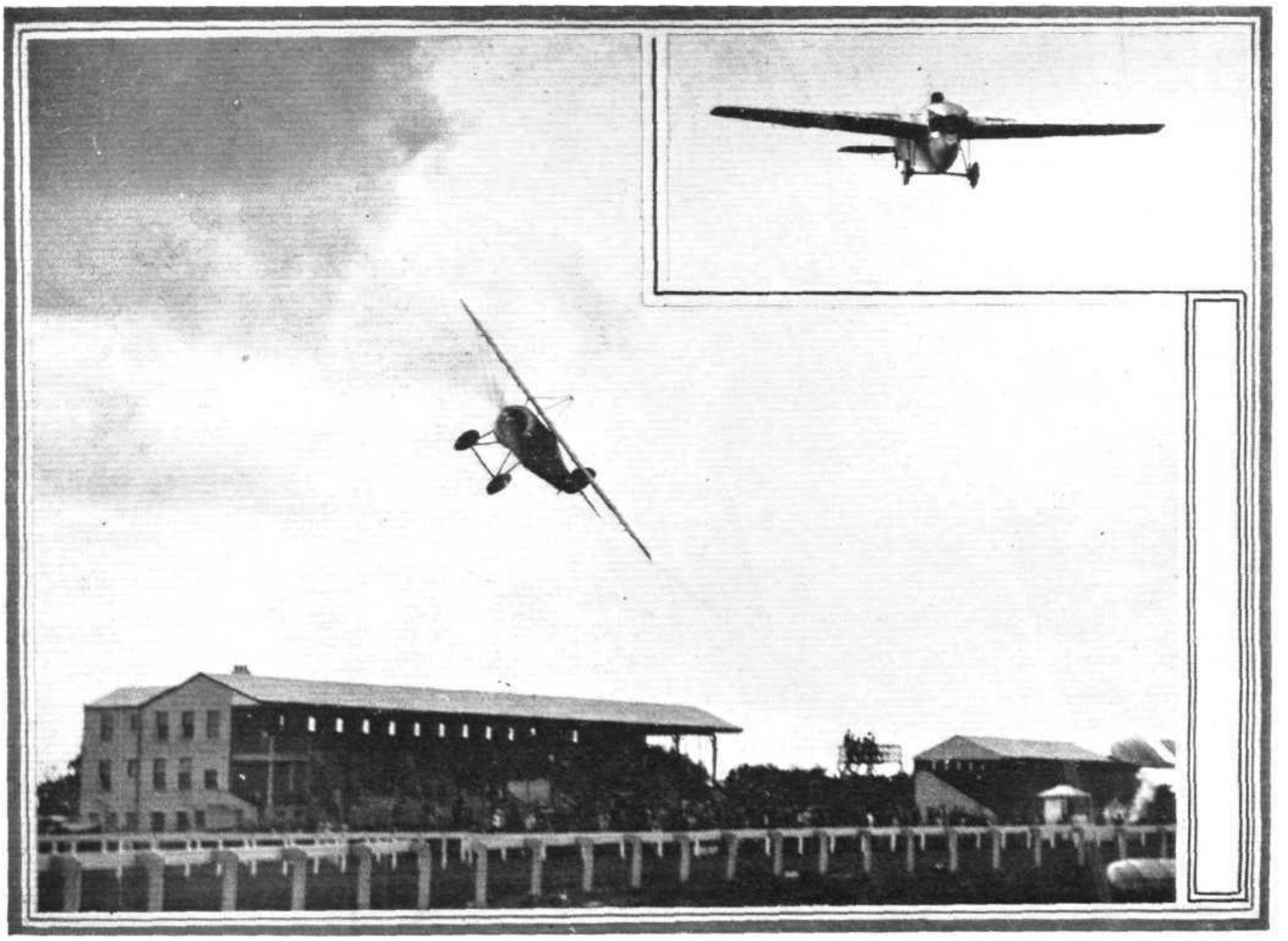
["FLIGHT" *Photograph*

THE BOURNEMOUTH AVIATION MEETING : The line up for the first event on Sunday—the Private Club Handicap, won by Capt. de Havilland's "Moth" (the third machine on the left).

The next event, the Christchurch Sprint, was a scratch race for D.H. "Moths," flown in two heats and a final over the same course (two laps in each), which produced eight entries. Four started in the first heat, viz. :—Two London Ae.C. "Moths," GEBNY, N. Jones, and GEBLI, Capt. Sparks ; Midland Ae.C., GEBLT, Capt. McDonough ; and Mrs. Eliott-Lynn's GEBKT. Sparks made a fine get-away, and obtained the lead with 'LT close on his tail, and 'KT and 'NY bringing up the rear. On the final lap Mrs. Eliott-Lynn fell into last place, but Sparks maintained his lead and came in first, with McDonough a good second.

The four starters in the second heat were two more London Ae.C. "Moths," 'MF, Major K. M. Beaumont, and 'NP, L. J. C. Mitchell ; Hants Ae.C., 'OH, F/O. R. H. Stocken ; and W. L. Hope's 'ME. These four soon arranged themselves in the following order :—'ME, 'NP, 'MF and 'OH, and continued thus to the very end. During this heat Stocken, in attempting to pass a rival near one of the turning points, struck a tree top with his wing tip, which was considerably damaged. Fortunately he maintained control, and even finished the heat.

First and second in each of these two heats then flew in the final, viz. :—Sparks on 'LI, McDonough on 'LT, Mitchell on 'NP, and Hope on 'ME. All made a smart get-away, and the struggle for a good position at the start was quite exciting. Hope obtained the lead, which he maintained to the finish,



["FLIGHT" *Photographs*

THE BOURNEMOUTH AVIATION MEETING : Two items from Sunday's big race—the Bournemouth Summer Handicap. D. A. N. Watt (who eventually won the race) winning the second heat on the "Swallow," and, inset, Flt.-Lieut. J. S. Chick winning the third heat.

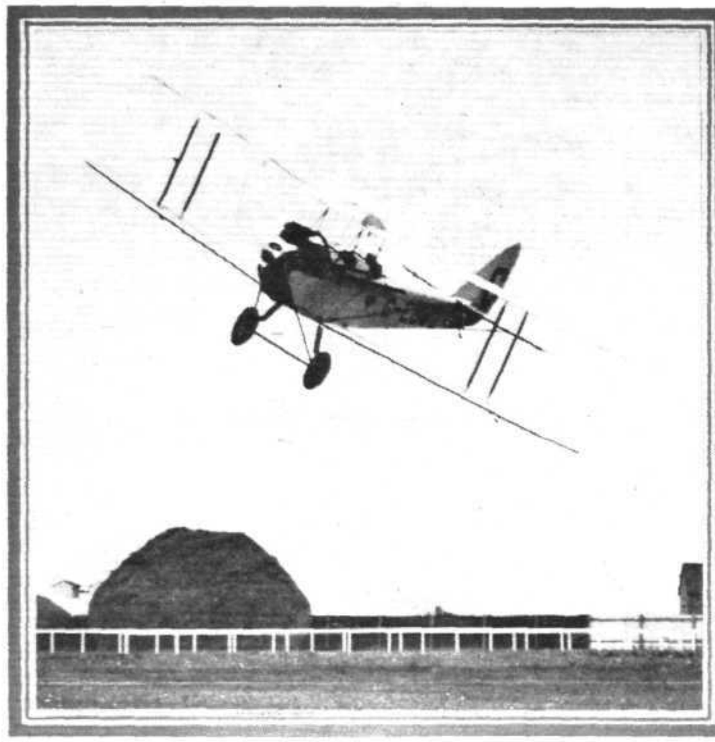
Sparks being a very close second. McDonough and Mitchell came in third and fourth respectively.

All this time it looked as if the meeting was going to be spoilt by rain, which had then started to fall intermittently, but fortunately for the spectators the grand stands afforded excellent shelter without interfering with the view. Immediately after the last race Capt. H. S. Broad went up on the King's Cup D.H. "Moth," GEBMO, and gave us a magnificent exhibition of stunt flying, which included some of his beautifully formed loops.

The Ensbury Park Low-Power Handicap, open to all aeroplanes with engines under 100 h.p., was flown immediately after this, in two heats and a final over the same 2-lap course. There were seven entries for the first heat, starting in the following order :—The Seven Ae.C. D.H.53 (A.B.C. "Scorpion") 'HZ, F./O. G. E. F. Boyes; R.A.E.Ae.C. "Hurricane" (Bristol "Cherub") 'HS, Ft.-Lieut. J. S. Chick; then four "Moths"—L.Ae.C. 'NY, S. L. F. St. Barbe; L.Ae.C. 'LI, Capt. A. G. Lamplugh; Midland Ae.C. 'LT, Capt. McDonough; and Mrs. Eliott-Lynn's 'KT; followed by Capt. G. de Havilland's "Moth" (Cirrus II) 'NO at scratch. McDonough was leading on the first lap, with Capt. de Havilland steadily overhauling him—'NO having already passed 'KT (Mrs. Eliott-Lynn). On the final lap Capt. "D.H." obtained an easy lead and came home first, with McDonough second, and Mrs. Eliott-Lynn third. The D.H.53 did not complete the course, giving up soon after starting, whilst Mrs. Eliott-Lynn, when about to land, was "crowded out" by the other machines (this had happened once before), and had to "try again."

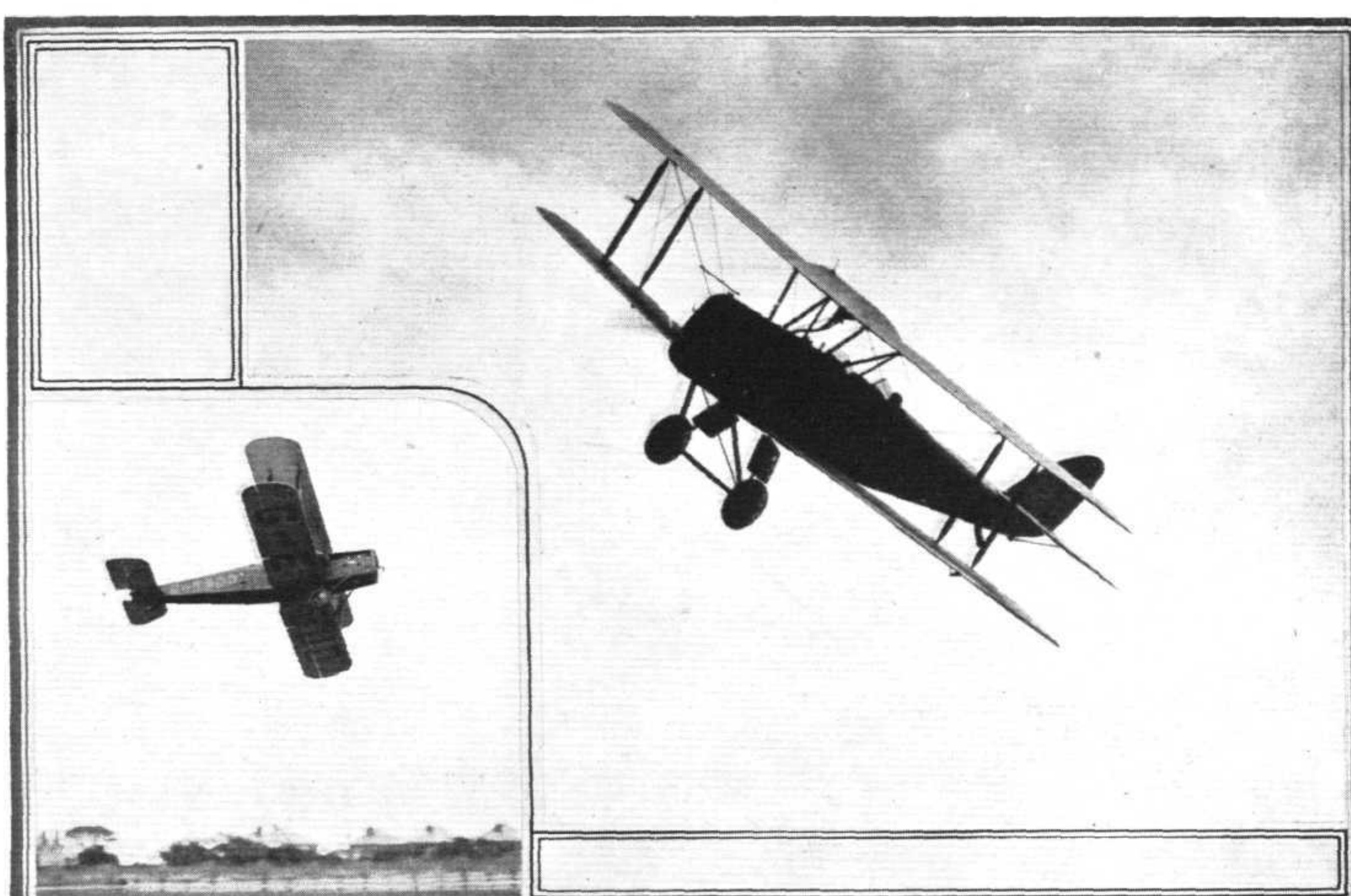
Three out of six entries started in the second heat, in the following order :—Two "Moths," L.Ae.C. 'NP, G. H. Craig, and W. L. Hope's 'ME; and Capt. Broad (for C. C. Walker) on "Moth" 'MO. Hope made a splendid getaway, and obtained the lead from the start, and came home a good first, with Broad not very far behind.

Before the final of this race was flown Miss June—who, it is reported, was a typist in E. R. Calthrop's Aerial Patents, Ltd.—went up in an Avro piloted by Lieut.-Col. G. L. P. Henderson, and made an exceedingly graceful parachute (Calthrop) descent from this machine when about 1,500 ft. above the aerodrome.



["FLIGHT" *Photograph*

THE BOURNEMOUTH AVIATION MEETING : Capt. H. S. Broad hurries off on the final of Sunday's Bournemouth Summer Handicap in the King's Cup D.H. "Moth."



["FLIGHT" *Photographs*

THE BOURNEMOUTH AVIATION MEETING : Two views of an enthusiastic owner-pilot : A. S. Butler, in his D.H.37 ("Nimbus"), starts off (left) on the Boscombe High Power Handicap, Saturday's record event, which he won, and (right), flying in the final of Sunday's Bournemouth Summer Handicap.

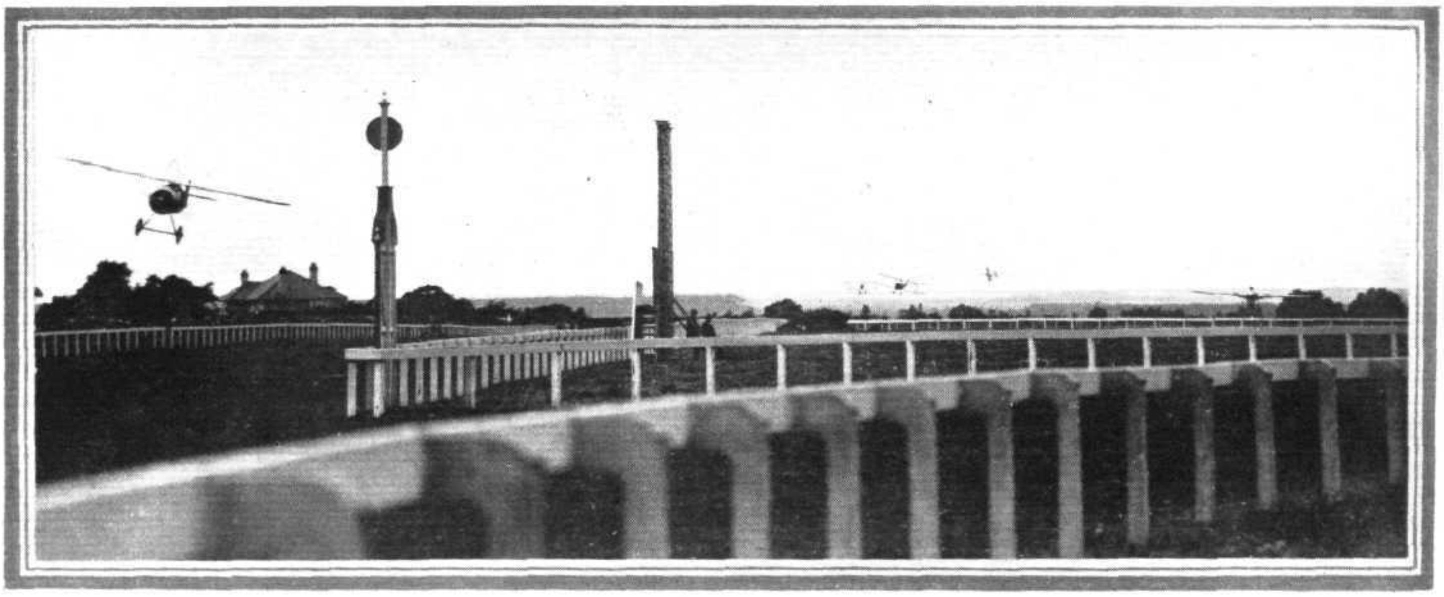
After this Bert Hinkler went up on the Avro " Gosport " (Mono-Gnome), and gave us a really thrilling exhibition of stunt flying. He executed some of the slowest rolls we have ever seen, without, apparently, the slightest effort. He also did some remarkable " autogyroing," at times hovering almost motionless over one spot.

Only three got away for the final of the Low-Power Handicap—Hope on 'ME, McDonough on 'LT, and de Havilland on 'NO. Broad, on the fourth " Moth " was a non-starter. Once again de Havilland got home first, and Hope came in second, but was later disqualified for not properly rounding turning point.

Saturday's official proceedings were brought to a close—by now in brilliant sunshine—with a bomb dropping contest, in which about a dozen competitors took part. This event was not particularly easy to follow from the spectator's point of view, the target being somewhat invisible at ground level. However, most of the shots went wide, and only a few hit ; this event resulted in a tie between Sparks and Craig

After this Capt. Sparks gave a very pretty display of exhibition flying, giving a good impersonation of the " autogyro." Then came the Private Owners' Handicap, a race of 20 miles (four laps of the course), open to all privately-owned aeroplanes. This produced eight starters (there were three absentees ; one, C. D. Barnard's SECM, making a gallant effort to start) as follows :—Flt.-Lieut. Chick, on the R.A.E. " Hurricane " ; Mrs. Eliott-Lynn and Hope, on their " Moths " 'KT and 'ME ; Capt. de Havilland, on 'NO ; Watt on the " Swallow " ; and Butler, on the D.H. 37. The " Hurricane " led the way until the end of the second lap, when Hope passed him at the turning point, and kept ahead up to the finish. " D.H. " passed Mrs. Eliott-Lynn on lap 3, and Chick on lap 4, but instead of finishing along the straight, continued on for another lap. Butler rapidly overhauled his rivals and finished his last lap close behind 'NO. The final placing was therefore : (1) Hope, (2) Butler (3) Mrs. Eliott-Lynn.

Following this race, Miss June made her second parachute



[" Flight " Photograph

A SPLENDID FINISH : The event of the day on Sunday at the Bournemouth Meeting was the final for the Bournemouth Summer Handicap. This was won—" at the last minute "—by D. A. N. Watt on the " Swallow " seen on the extreme left about to cross the line, from Flt.-Lieut. J. S. Chick on the R.A.E. " Hurricane," seen " jumping the hurdles " on the extreme right. Three remaining machines in the race are also to be seen (centre), the nearest being W. L. Hope on the " Moth " next A. S. Butler on the D.H.37, and, banking round into the straight, H. S. Broad on the red-and-white " Moth."

of the London Aeroplane Club. As for the rest of Saturday's proceedings, it only remains to report that Mr. Bramson gave an exhibition of sky writing on the S.E.5A, and a very large number of passengers were taken up for joy-rides after the close of the racing.

Sunday.—The second day of the meeting, Sunday, was blessed with glorious weather—real Bournemouth summer sunshine—but the wind had shifted more from the west (besides being somewhat stronger during the early part of the programme) with the result that landing was rendered somewhat tricky.

Just before the proceedings opened Bert Hinkler ascended in the Avro " Gosport," and did a little stunting, including some aerial steeplechasing, which consisted of flying low along the " straight " and hopping over the hurdles.

The first event, which was a little late in starting, was the Private Club Handicap, open to any type of aeroplane entered by any recognised flying club. The course was over the two laps, and six out of nine entries started as follows :—F./O. Boyes, on the Seven Ae.C. D.H. 53 'HZ ; Flt.-Lieut. Chick, on the R.A.E. " Hurricane " 'HS ; Mrs. Eliott-Lynn (British Private Aircraft Owners' Club), on " Moth " 'KT ; Capt. de Havilland, on " Moth " 'NO ; D. A. N. Watt on the " Swallow," GEACZ ; and A. S. Butler, on the D.H. 37 " Nimbus." Once again Boyes had to retire soon after starting.

In this race Capt. de Havilland soon overhauled the three in front of him, and Watt and Butler were unable to pass the others, so " D.H." secured another win, with the persistent little " Hurricane " close on his tail. Mrs. Eliott-Lynn finished third, Butler and Watt being fourth and fifth. Lieut. Chick, though second, was disqualified for not correctly rounding the turning point, so Mrs. Eliott-Lynn won second prize.

descent from the Avro. This time she was unable to release herself from the parachute on touching the ground, with the result that she was dragged along by the parachute for some distance. Col. Henderson landed just at that moment, and taxied to her assistance, but fortunately Miss June was quite unhurt.

Another big race followed this event—the Bournemouth Summer Handicap, open to any type of aeroplane. This was undoubtedly the best race of the meeting, and produced some good sport. It was flown in three heats of 10 miles (2 laps) and a final of 20 miles (4 laps). Four started in the first heat, thus :—Sparks, on the L.Ae.C. " Moth " 'LI ; Broad, on " Moth " 'MO ; C. D. Barnard, on the SECM ; and Butler, on the D.H. 37. Barnard retired at the end of the first lap. Sparks, who was leading at first, was overtaken by Broad on the last lap, whilst Butler overhauled both, and came home first.

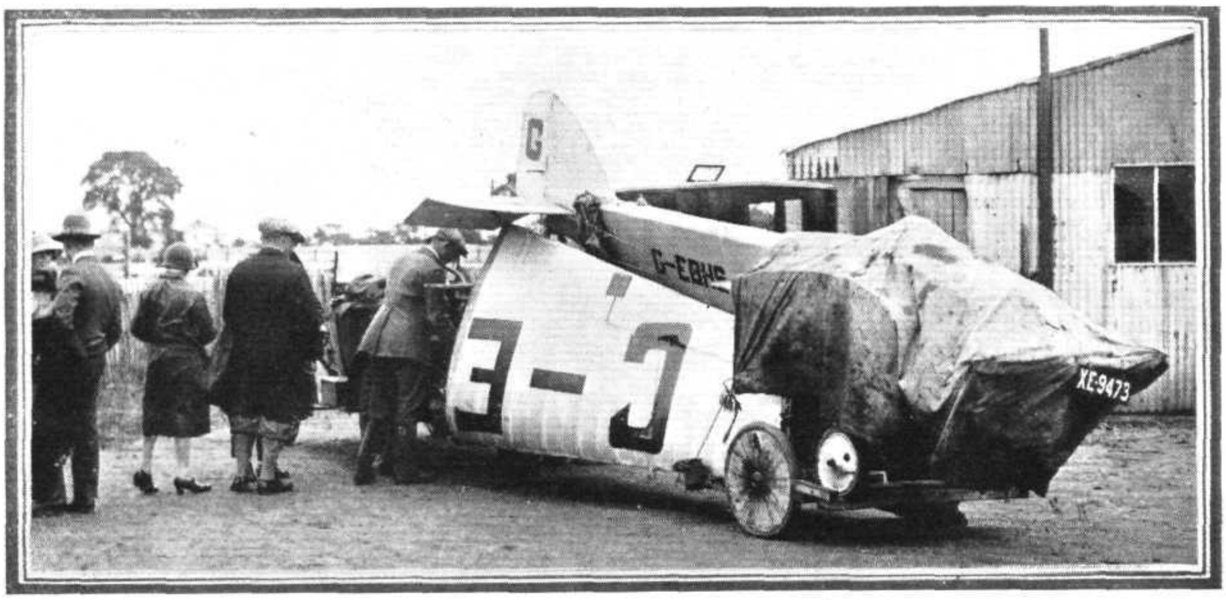
Just before the start of the second heat Mr. Bramson went up in the S.E.5A and made a beautiful and enormous orange smoke ring right round the aerodrome, only a few hundred feet up.

There were five starters in heat 2, viz., three " Moths " all together, L.Ae.C.'NY, St. Barbe, and 'NP, Capt. Lamplugh, Hants Ae.C.'OH, Flying Officer R. H. Stocken ; then Wing-Commander Sholto Douglas on his Avro-Airdisco 'KN ; and Watt on the " Swallow." In this heat Watt overhauled his rivals one by one, and finished first, with Douglas obtaining second place from the " Moths," which finished (3), 'NY ; (4), 'OH ; and (5), 'NP.

Heat 3 saw another five starters, thus :—Boyes on the " Seven " D.H. 53 ; Chick on the R.A.E. " Hurricane " ; Hope on 'ME ; and McDonough on 'LT off together ; " D.H." on 'NO. Boyes once again had bad luck, and retired after completing the first lap, leaving the " Hurricane " leading the field. The others were unable to pass Chick, who won

The calm arrival of the "Hurricane" at Bournemouth: The R.A.E. "Hurricane" (Bristol "Cherub") came to Bournemouth by road, as shown.

["FLIGHT" Photograph



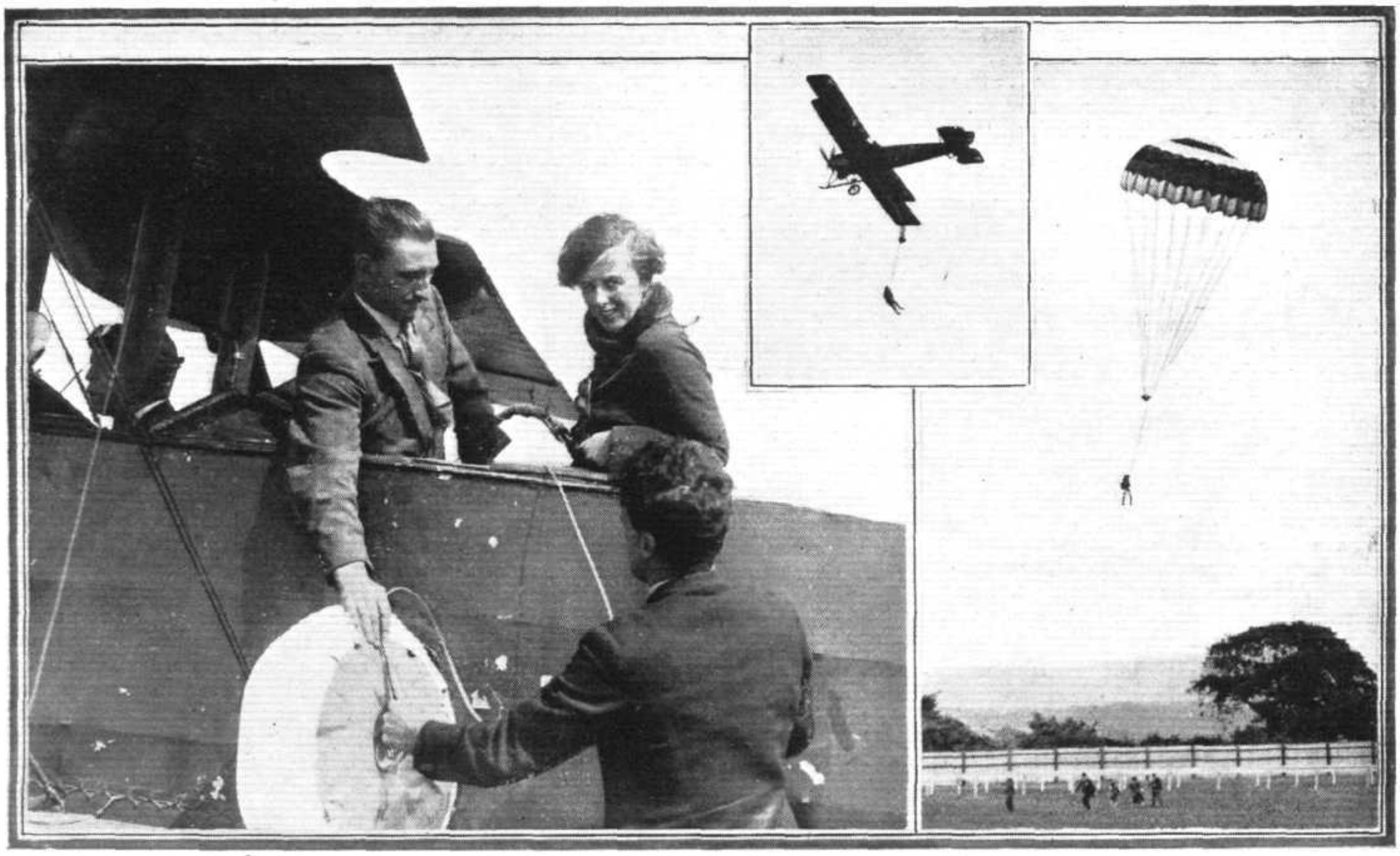
first place, then came Hope, whilst "D.H." fought his way up to third, leaving McDonough to finish last.

Before the final was flown Broad went up on 'MO and gave us another of his neatly executed displays of stunts, following which Mrs. Eliott-Lynn ascended in 'KT and put up some nice loops, spins and rolls.

Then came the final, the best race of the meeting. The starters were :—Chick on the "Hurricane"; Hope on 'ME; Broad on 'MO; Douglas on 'KN; Watt on the "Swallow"; and Butler on the D.H. 37. Watt and Butler started when some of the others were starting on their second lap. Chick maintained the lead until just before the finish, when Watt spurted ahead of him. Close behind Chick came Hope, with Butler making a big effort to get ahead. Broad followed fifth not far behind, and Douglas brought up the rear a few seconds later.

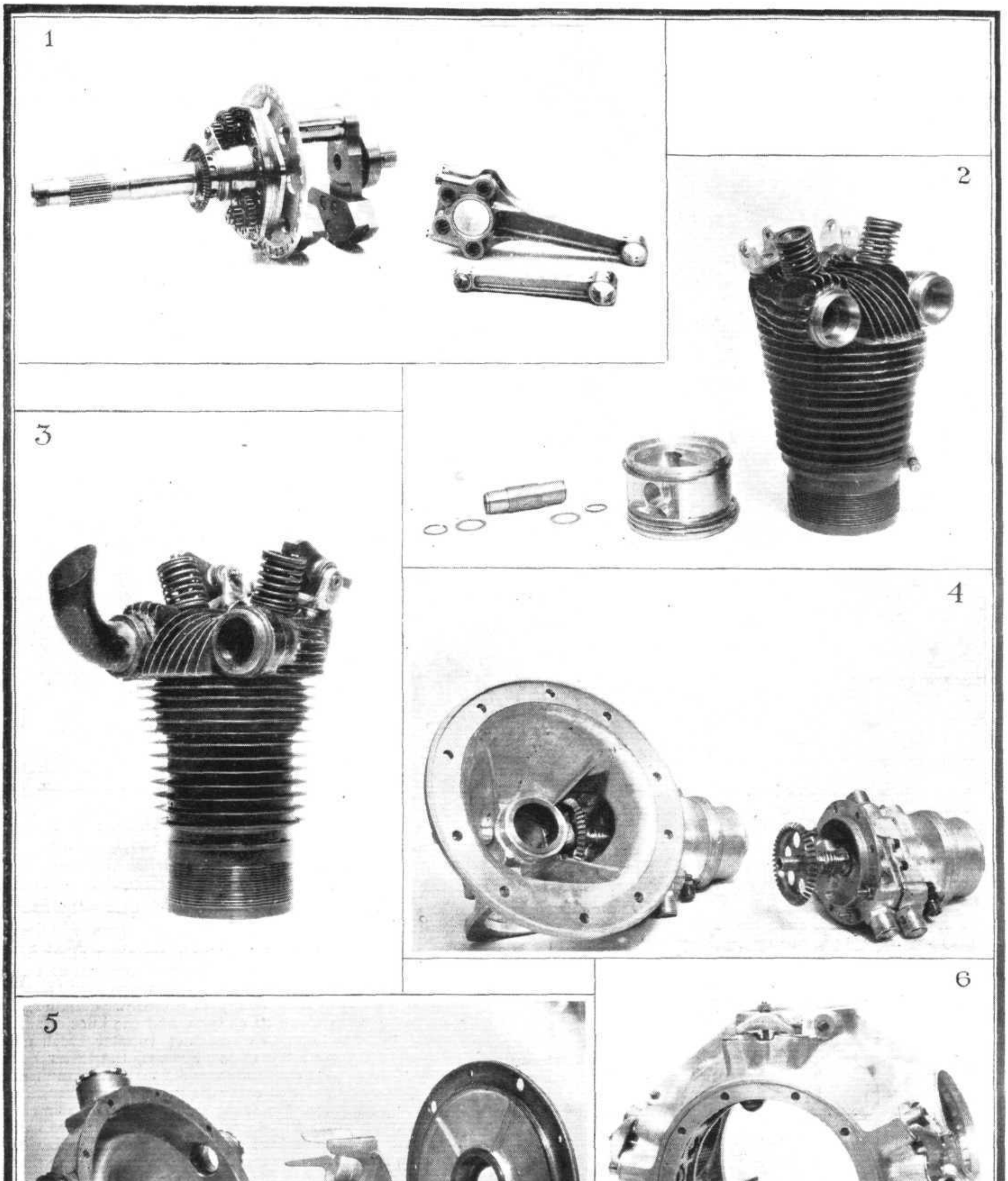
The next event was the Light Aeroplane Club Members' Scratch Race, in which four D.H. "Moths" took part. The starters were :—Midland Ae.C. 'LT, E. L. Brighton; London Ae.C. 'NY, Maj. Beaumont; London Ae.C. 'LI, Mrs. Eliott-Lynn; and London Ae.C., 'NP, G. H. Craig. Mrs. Eliott-Lynn had a much better chance on 'LI than on 'KT, which is obviously feeling somewhat tired of life, and made the best of her new mount, for she flew an excellent course and won the race. Craig came in second on 'NP, whilst Beaumont finished third, so the London Ae.C. did well in this, the last race of the meeting.

The final event of this successful seaside meeting was another Bomb Dropping Competition. The marksmanship was, perhaps, a little better this time, and the London Ae.C. scored another win by Sparks being placed 1st in this event.



["FLIGHT" Photographs

"JUNE FALLS IN AUGUST": On both Saturday and Sunday at the Bournemouth Aviation Meeting Miss June executed a graceful parachute (Calthrop) descent from an Avro piloted by Lieut.-Col. G. P. Henderson. She is seen on the left preparing to ascend, and, centre, just leaving the Avro, and finally, right, about to land.

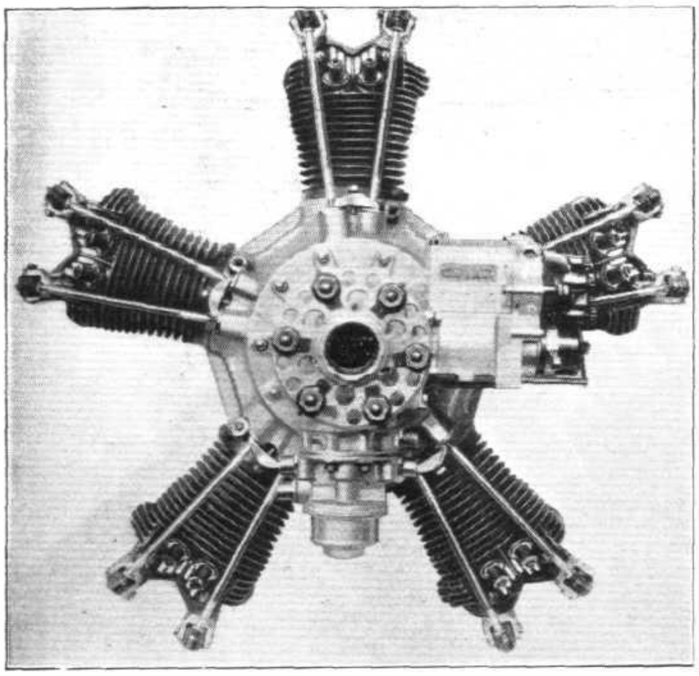


DETAILS OF THE ARMSTRONG-SIDDELEY "GENET" ENGINE: 1, Crankshaft, cams, master connecting rod and plain connecting rod. 2, a cylinder, piston, and gudgeon-pin, etc. 3, a cylinder with valves and rockers in place. 4, the oil pumps with housing and drive. 5, the induction system. 6, the crank-case (see p. 532).

THE ARMSTRONG-SIDDELEY "GENET"

Normal Power 65 b.h.p. at 1,850 r.p.m. (*See also page* 531.)

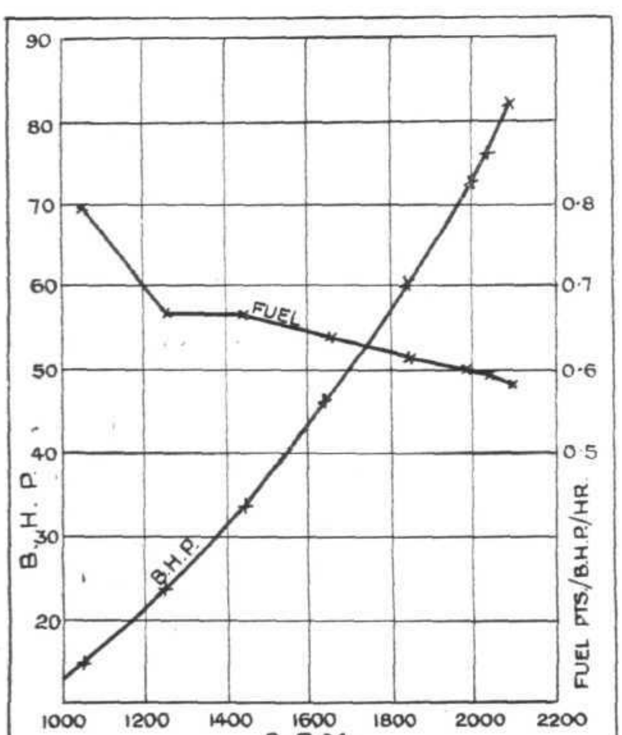
THE "Genet" is the latest and smallest of the well known Armstrong-Siddeley series of static radial air-cooled aero engines, its general design following that of the "Jaguar" and of the "Lynx," and naturally incorporating all that



THE ARMSTRONG-SIDDELEY "GENET": Front view. Note the mounting on the front of the engine of magneto, oil pump, etc., in very accessible positions.

extended experience in the production of these engines has shown to be of value.

While built primarily to compete in the *Daily Mail* light aeroplane competition, the "Genet" has been developed on lines that will allow it to be produced on a commercial basis for use on light aeroplanes generally. Being of the static radial type, it scores on the grounds of accessibility, simplicity, and ease of maintenance, three vital qualities as far as the owner-pilot is concerned. The radial arrangement also is particularly convenient when adjustments or dismantling become necessary.



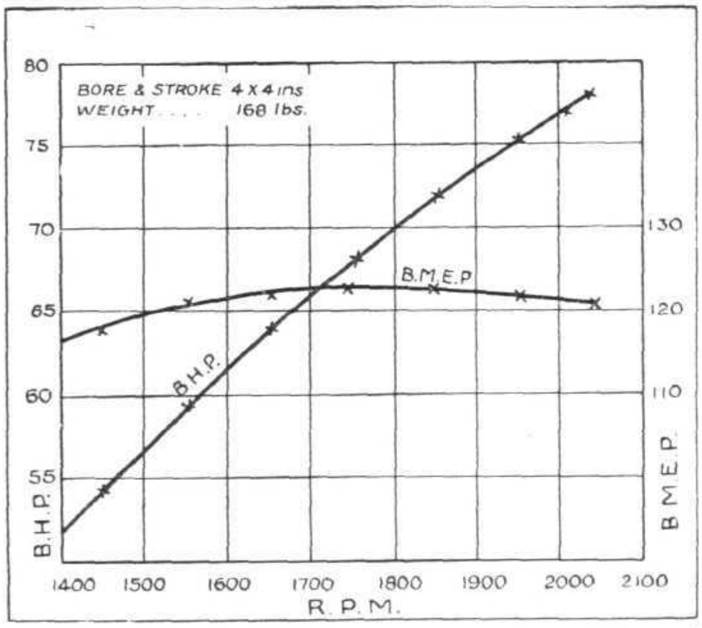
Power and fuel-consumption curves of Armstrong-Siddeley "Genet" engine.

Main Features of the Engine

The engine has five air-cooled cylinders which are arranged radially and measure 4 in. by 4 in. bore and stroke. Its normal revolutions are 1,850 per minute, at which speed it develops 65 h.p. When speeding up to its maximum of 2,035 r.p.m., some 75 h.p. are obtainable with a standard compression ratio at 5·2 to 1. The petrol consumption at the rated horse-power is 0·575 pints per brake horse-power hour, and the oil consumption 1 pint per hour, 80 per cent. Shell aviation and 20 per cent. benzole being the recommended fuel, and Castrol "R" the recommended lubricant. The unit complete with one magneto, carburettor, air-intake, short exhaust pipes, propeller boss, and speedometer drive scales 168 lbs., while its overall cylinder diameter and length are respectively 32·6 in. and 30·1 in.

The Construction of the Engine

The five steel cylinders are screwed into steel adapters located in the aluminium crankcase, where they are locked



Power curve, etc., of Armstrong-Siddeley "Genet" engine.

with a double cone lock ring. The aluminium alloy semi-spherical heads are shrunk, screwed and lock-ringed on to the cylinders, the valve seats and plug bosses also being shrunk in. There are two inclined overhead valves per cylinder, the exhaust being made of cobalt chrome, and the inlet of stainless steel. Duplex valve springs and tubular steel push rods are operated by roller ended tappers, the latter being driven by a slow-speed camshaft worked from the crankshaft through the medium of two epicyclic gears. The crankshaft runs on ball bearings, the front main bearing taking the propeller thrust, while the propeller journal loads are taken by a plain bearing contained in the front cover which also serves as an oil retainer for the oil on its way from the pump to the crankshaft.

The master rod is made in one piece, while the master ring and the auxiliary rods are of "H" section. The "Y" alloy forged pistons are fitted with two rings and a scraper ring above the floating gudgeon pin, and one scraper ring below it. Ignition is provided by an accessibly placed B.T.H. magneto driven by bevel gear from the crankshaft. For the competition only one plug per cylinder is fitted, but provision is made for another to be added on the standard engines. The mixture is controlled by a Zenith carburettor, a mixing fan being provided in the induction system as on large Armstrong-Siddeley aero engines. The lubrication relies on the dry sump system, the pump unit incorporating the pressure and scavenge pumps, which are driven by a vertical shaft from the crankshaft, and being most accessibly located in front of the engine. The scavenge pump, which is 50 per cent. larger than the pressure pump, transfers the oil from the engine to the tank, the pressure pump being relied upon to feed the lubricant from the tank to the crankshaft.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

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CONTENTS

OUR CONTRIBUTORS

Holidays have been responsible for a somewhat "thin" section of THE AIRCRAFT ENGINEER this month, a number of contributions which had been promised for the present issue having failed to turn up in time to be included. While the Editor naturally deplores this fact, he has been unable to remedy it, but it is hoped that the next issue will make up by being a fairly large one. Among the "missing" articles is Dr. Aitchison's instalment in the series on Duralumin—Dr. Aitchison having been among those who took a (doubtless well-earned) holiday during August. We trust he will feel all the better for his "heat treatment," and that when he resumes his series of articles he will show no signs of "fatigue."

Mr. J. D. North turns his attention from aerodynamic to structural design in the present issue and commences a discussion on "Structural Policy in Design." The subject of load factors and factors of safety is dealt with at some length, and some very interesting information is contained in the tables of data from two Boulton and Paul machines, the information being here published for the first time. As the subject is one of very great importance at the present moment we feel that thanks are due to Mr. North's firm for having given permission for the material to be published for the benefit of other designers.

The subject of stresses in a terminal velocity nose dive, and when pulling out of such a dive, is considerably to the fore just now, and any light that may be thrown on such conditions as still remain obscure is to be welcomed on all sides. In the United States load factors considerably greater than those demanded in this country are now used, and in his article Mr. North calls attention to some interesting experimental results that have been obtained in America relating to the accelerations that may be expected. Thus in a vertical bank the highest loads appear to have been reached, amounting to no less than 5·7 times g, while in pulling out of a dive at a speed of 162·5 m.p.h., the acceleration was found to reach the very high figure of 7.8 g. When it is realised that modern single-seater fighters probably have terminal velocities of close upon 300 m.p.h., it will be realised that some quite extraordinary loads may be expected, and, apart from structural considerations, the physical effect on pilots is likely to be a very serious factor.

AIRCRAFT PERFORMANCE.

Structural Policy in Design.

By J. D. NORTH, F.R.AE.S.

(*Continued from p.* 71.)

A number of complex considerations go to determine the structural policy adopted in aeroplane design. The conditions peculiar to flying, which make it impossible to produce an aeroplane capable of withstanding any possible flight loads, have given rise to a policy where a compromise between utility and safety is adopted. Attempts have been made to arrive at a solution to the problem analytically, but to a large extent the structural design depends on experience. It is quite obvious that where experience of flying large numbers of aeroplanes designed to meet certain conditions has shown that these machines are immune from structural failure, it is not advisable to increase the weight to meet modified conditions suggested by analysis without very careful investigation. A rough indication of the factors governing structural policy in aeroplane design is given in Table I, which is self-explanatory. On the analytical side attention has been principally directed to the study of loads arising from motions due to the pilot exercising his fullest physical capacity; in some cases this conception has been simplified by assuming that the physical strength of the pilot is sufficiently great to move any or all of the control members to their fullest extent under any conditions. It seems not unreasonable that the real motions of an aeroplane will have a psychological basis, that is to say, that they depend on the voluntary action of a pilot. As the loads found by studying the motion on a physiological basis demand structures outside the range permitted by considerations of utility, it is found necessary to adopt fractional factors of safety. This seems to imply the somewhat unjustifiable assumption that the actions of a reasoning individual can be expressed as a numerical factor of the actions of a physical being without intelligence.

It is important not to undervalue the traditional influence of pre-war design and flying. From 1910 to 1914 successful flying was sufficiently common to enable considerable experience to be obtained structurally to enable a factor (at this time of the order of 6) to be given which, if applied in the rather crude manner then possible, produced a more or less consistent structure of about the same weight and strength as the successful machines of the period. It must be remembered that looping and upside-down flying were considered as aerobatic feats for which the aeroplane required to be specially designed or strengthened, that pulling out of a terminal nose dive was considered to be (and in all cases

when it had been attempted had been) a certain cause of collapse of the structure. At that time, therefore, pilots had a definite feeling of the connection between the design of the machine and the manœuvres which could safely be performed with it. Under the strong stimulus of war necessity methods improved and developed, largely by investigations following accidents, partly by analysis. The development of large aeroplanes required lower factors if they were to be of a reasonable weight, and lower factors were adopted, since it was felt that pilots would not manœuvre these large machines so violently. Pilots appear to have respected the restrictions imposed upon them, and machines constructed to these lower factors have been satisfactory. If, however, it were necessary to pull a large machine violently out of a terminal nose dive, the actual accelerations experienced would probably be of the same order as in a small aeroplane, even though the latter has a much greater manœuvrability if the pilot were to make use of it.

Whatever the policy adopted, it is desirable to have some simple numerical method of expressing it. It is very convenient to adopt the ratio of the maximum acceleration of the centroid of the aeroplane to the acceleration due to gravity, and to describe this non-dimensional figure as the load factor.

be found by determining the minimum value of k_L which will give an acceleration Ng at a velocity not exceeding the terminal nose diving velocity, *i.e.*, $k_L = \frac{N.W}{\rho S.V_t^2}$. This makes the assumption that the centre of pressure moves back with diminishing k_L and that in pulling out from a dive the velocity has dropped off very slightly when the maximum acceleration is reached. If k_m is correctly known as a function of k_L, the maximum load on the rear truss can easily be determined. The tail loads corresponding to these conditions can be readily found, as also the loads in the steady flight condition of a terminal nose dive. All these are dependent solely on longitudinal motion.

It is suggested that the terminal velocity should be used, not because it is considered that the terminal velocity is of very great actual significance, but because investigation has shown that, even in this apparently worst possible case, the loads on the rear truss are generally smaller than those obtained with the present-day load factors (C.P. back). The C.P. back position was formerly arbitrarily taken at about 0·5 of the chord, and now aeroplanes are designed for the C.P. in a position corresponding with the maximum speed of horizontal flight. I do not see what relation this latter

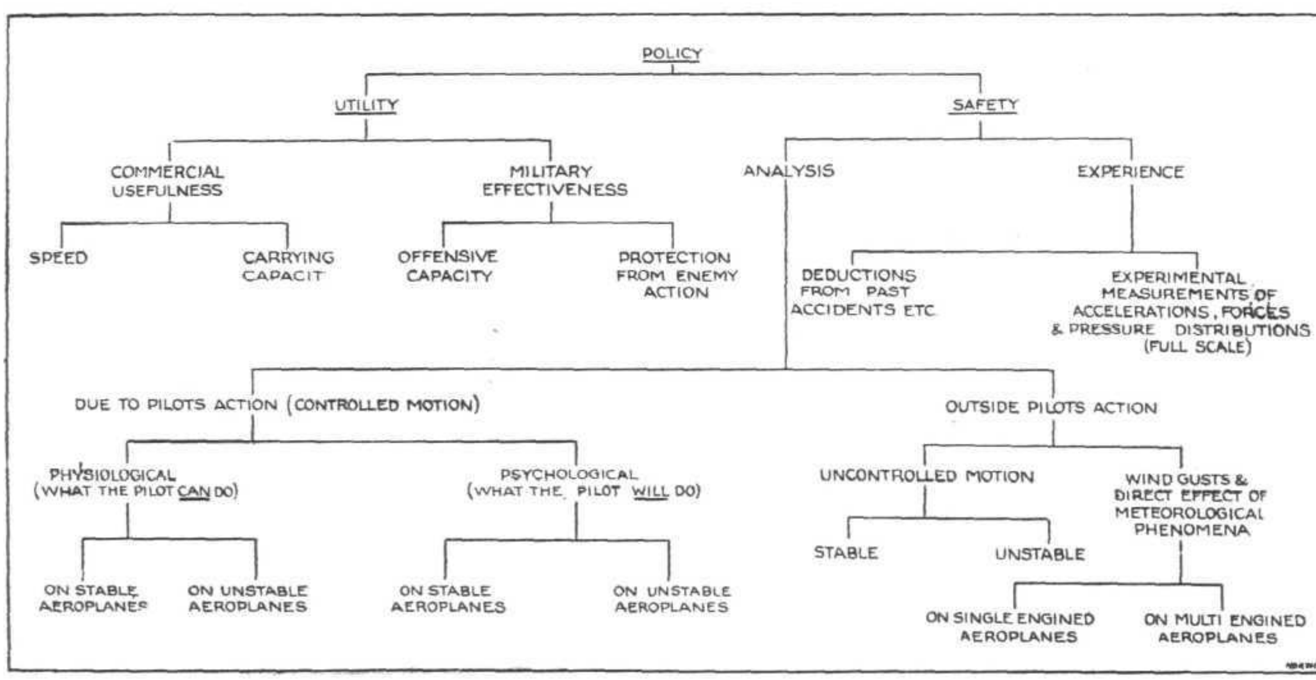

TABLE I : Derivation of the Principal Load Factor

If we accept the suggestion that an aeroplane should be capable of any flight manœuvre in which this number is not exceeded, we should arrive at a consistent method for determining the size of all the structural members of the machine. As regards certain parts of the aeroplane, it is not difficult to put this idea into execution. The load on the front truss is determined because it can be readily shown that the acceleration Ng can occur with the centre of pressure on the main planes in its furthest forward position. Before turning to other conditions there is an important point to decide. The load factor as at present understood covers not only the added loads due to manœuvring but also defects in material and workmanship, and provides for loss of strength due to deterioration. It would, therefore, be more correct to determine the strength of members by giving them a factor of safety (F) when the acceleration is Ng. It is quite clear that under these circumstances if the aeroplane is to be of approximately the same structure weight, N will have to be reduced, which will result in modifying the flight conditions. It may be argued that F may be either a factor of stress or a factor of load. The stress factor has certain rational considerations in its favour; the load factor is more in accordance with current practice. An aeroplane to-day which has a "load factor" of 6 might be represented as being designed for $N = 4$, $F = 1.5$.

A fair approximation to the loads on the rear truss may

position has to the actual conditions in flight manœuvres, and I refer to the older method of the arbitrary C.P. in making comparisons, as this is more representative of aeroplanes of which we have experience.

The following work is based on investigations made some time ago by the experimental staff of Messrs. Boulton & Paul, Ltd., in respect of two aeroplanes of their design; the P.7 is the Boulton & Paul Bourges, with twin Dragonflies, load factor 4·5, C.P. back; the P.9, a two-seater, R.A.F. 1A engine, load factor 5, C.P. back. Both machines have R.A.F. 15 wing section. The other principal characteristics are given in the appendix. In the case of the P.7, a number of detailed investigations into the motions of the machine and pulling out from dives at varying velocities are available for comparison. The results are expressed non-dimensionally by $\frac{R(b-a)}{cnW}$. The corresponding values with the load factors and C.P. position as designed were :—

P.7	2·002
P.9	1·536

These figures are everywhere higher than those found by the methods now given.

The results quoted refer, of course, only to two individual aeroplanes, and refer in the case of nose-diving loads to the

usual $\Omega\,\frac{Wc}{l}$ expression. Ω and γ curves, somewhat after the manner of C.I.M. 22, were, however, constructed to suit the different series of moment coefficients. The whole investigation might very advantageously be extended to some other aeroplanes, in order to obtain a wider range. The very important influences of the varying scale moment coefficients is emphasised by the alarming differences shown in the last table

In coming out of a vertical dive where there is a range of speed and for every speed a range of pulls on the control column, there is a possibility of flattening out at any speed, within limits, in any attitude.

The total load thrown on the wings is a variable quantity, and if we assume that this load shall not exceed n times the weight of the aeroplane, limits are placed on the force that can be exerted when once the speed is above a certain quantity.

If the limiting velocity in a nose dive is V_1, the force exerted must be such that the angle of incidence, measured from no lift, shall not exceed the value given by

$$nW = 0{\cdot}0375\,\alpha\,\rho SV_1^2 \text{ (constant for R.A.F. 15 only)}$$

$$\text{or}\quad \alpha = \frac{nW}{0{\cdot}0375\,\rho SV_1^2} \quad \ldots\ldots \quad (1)$$

Coming out from a dive at a lower velocity V_2, the attitude may pass that of stalling: hence, the aeroplane can pass through the position of C.P. in its most forward position with a load of n times the weight on the wings. With limiting velocity it cannot have a value of α greater than that defined by (1) without breaking the wings. This value of α with a value of n of five may be of the order of 5°, with a corresponding centre of pressure coefficient of about 0·3. With such a position and wing loading it is possible that the loads to be taken by the rear spar are greater than in the dive itself, and this possibility requires investigation.

Unfortunately, evidence as to the moments of the wings only exists with any degree of accuracy for the condition of steady flight. Such evidence as there is for wings with a definite angular velocity tends to show that the moments round the leading edge are increased numerically by a positive angular velocity. If, then, we take the conditions of steady flight in the particular attitude, the loads on the rear spar will be somewhat on the small side.

Consider the case where the wings have a load nW:—

Let

k_c = C.P. coefficient,
F = load on front spar,
R = load on rear spar,
a = distance of centre of front spar from nose,
b = ,, ,, rear ,, ,,

Then $F + R = nW$
$aF + bR = nWc.k_c$

Hence R is given by

$$\frac{R\,(b-a)}{c.n.W} = k_c - \frac{a}{c} \quad \ldots\ldots \quad (2)$$

For a given aeroplane W, a, b, c are fixed, so that the value of R depends on the product $n\left(k_c - \frac{a}{c}\right)$. With increasing incidence of the planes k_c diminishes, but n increases: with reasonable values for a/c no case has been found where the product $n\left(k_c - \frac{a}{c}\right)$ did not increase with n, so that the greatest value to be obtained for R from equation (2) is when n has its greatest value.

In coming out of a nose dive with limiting velocity the maximum value of R is given by the maximum value of n.

The worst case is *either* in a nose-dive with limiting velocity *or* coming out of such a dive when the load taken by the wings is the maximum permissible.

In the nose dive the lift on the wings balances the down load on the tail. Knowing the latter, k_L for the particular incidence can be determined, and therefore k_m.

We have, then, if L′ is the down load on the tail,

$$F + R = L'$$
$$aF + bR = -k_m c\,\rho SV^2.$$

Hence R is given by

$$R\,(b-a) = -k_m c\,\rho SV^2 - aL' \quad \ldots\ldots \quad (3)$$

This may be written as

$$R\,(b-a) = cL'\,(k_c - a/c) \quad \ldots\ldots \quad (4)$$

From either (3) or (4) R may be determined and the value compared with that obtained in the other case.

Unfortunately, the value of k_m is not known definitely, as is shown below in two special cases where the values of k_m used are those given as under :—

(A) Full scale R. & M. 400 $vl \doteqdot 500$
(B) Model R. & M. 440 $vl \doteqdot 25$
(C) Model monoplane. T. 709 $vl = 10$
(D) Full scale corrected for stagger.

The load on the tail plane is taken as $\frac{\Omega Wc}{l}$, where Ω is determined from our own graphs. (*See* R.R. 90).

P.7.

W = 6,326 lbs.		l	= 21·5
S = 756 sq. ft.		k_r	= 0·0234
c = 7·37 ft.		a/c	= 0·124
n = 5·5		d	= 1 ft.
h = 0·315		k	= − 0·200
a = 0·917 ft.		d/c	= 0·136

	A.	B.	C.	D.
k_D at no lift	0·0085	0·0156	0·0083	0·0085
V ft./sec.	333	301	334	333
k_L	0·175	0·214	0·174	0·175
For lift = $nW - k_m$ ...	0·0415	0·0535	0·0585	0·0446
k.	0·237	0·250	0·336	0·255
$\frac{R(b-a)}{c.n.W}$	**0·113**	**0·126**	**0·212**	**0·131**
γ	0·0206	0·0136	0·0129	0·0206
Ω	0·64	0·35	0·39	0·64
Down load on tail ...	1,387	759	846	1,387
k_L	0·0070	0·0047	0·0042	0·0070
$-k_m$	0·0200	0·0145	0·0105	0·0196
$-k_m\,\rho cSV^2$	29300	17350	15460	28700
$\frac{R\,(b-a)}{c.n.W}$	**0·109**	**0·063**	**0·055**	**0·103**

The results are better expressed as under :—

	A	B	C	D
Coming out of dive ; $\frac{R}{W}(b/c - a/c)$	0·622	0·693	1·166	0·720
In dive : $\frac{R}{W}(b/c - a/c)$	0·600	0·347	0·303	0·566

P.9.

W = 1,800 lbs.		
S = 282 sq. ft.		
c = 5·5 ft.		
n = 7·0		
h = 0·307	k = − 0·225	
a = 0·875 ft.	a/c = 0·159	
l = 15·5 ft.	d = 1 ft.	d/c = 0·182
k_r = 0·02085	$k_r\frac{d}{c}$ = 0·0038	

	A	B	C	D
k_D at no lift	0·0085	0·0156	0·0083	0·0085
V ft./sec.	303	272	304	303
k_L	0·205	0·255	0·204	0·205
For lift = $nW - k_m$ ...	0·0461	0·0623	0·0666	0·0499
k_c	0·225	0·244	0·326	0·243
$\frac{R(b-a)}{c.n.W}$	**0·066**	**0·085**	**0·167**	**0·084**
γ	0·0211	0·0141	0·0134	0·0211
Ω	0·71	0·39	0·44	0·71
Down load on tail ...	454	249	281	454
k_L	0·0074	0·0050	0·0046	0·0074
$-k_m$	0·0201	0·0146	0·0107	0·0200
$-k_m\,\rho cSV^2$	6780	3920	3630	6740
$\frac{R(b-a)}{c.n.W}$	**0·092**	**0·031**	**0·049**	**0·091**

The results are better expressed as under :—

Coming out of a dive :

$\frac{R}{W}(b/c - a/c)$ … …	0·462	0·595	1·169	0·588

In dive :

$\frac{R}{W}(b/c - a/c)$ …	0·644	0·217	0·343	0·637

A comparison of these results shows that the values of k_m to be used require investigation, and until the correct value has been determined, the maximum load on the rear spar will remain an uncertain quantity, as also the conditions under which it arises.

The values of k_r given above contain the k_r for the propeller as well as that of the rest of the aeroplane, and the limiting velocity is worked out with this value.

Analytical investigation has shown that the maximum load on the wings in coming out of a dive is reached very soon, and that by this time the velocity has changed but slightly.

Owing to the velocity being slightly less than the limiting velocity, the error in taking the moment round the wings, the same as if in steady flight, is diminished.

So far a comparison has been made between the loads on the rear spar in a vertical nose-dive with terminal velocity and in coming out of a dive. The maximum load on the wings in the latter case is taken as the weight of the aeroplane, "W," multiplied by the load factor "n," and no factor of safety "f" has been taken for the other case.

The work will now be recast with the factors of safety 1·25 and 1·75, so that the maximum load on the wings is $W\frac{n}{f}$, and the consequent load on the spar will then be multiplied by "f." For the nose dive case the load on the spar obtained in the previous work will simply have to be multiplied by F. The figures for k_m will be taken as in R.R. 81 :—

(*a*) Full scale	R. & M. 400	$vl \doteqdot 500$	
(*b*) Model	R. & M. 440	$vl \doteqdot 25$	
(*c*) Model aeroplane T. 709		$vl = 10$	
(*d*) Full scale, no stagger		$vl \doteqdot 500$	

Factor of Safety $= 1·25 = f$. $n_1 \equiv n/f$.

P. 7.	A.	B.	C.	D.
k_L … … …	0·140	0·171	0·139	0·140
for Lift $= n_1W - k_m$ …	0·0365	0·0471	0·0490	0·0389
k_c … … …	0·261	0·275	0·353	0·278
$\frac{R_1(b-a)}{c.n_1.W}$ … …	0·137	0·151	0·228	0·154
$\frac{R}{W}(b/c - a/c)$ … …	0·75	0·83	1·25	0·85
In dive :				
$\frac{R}{W}(b/c - a/c)$ … …	0·75	0·44	0·38	0·71

P. 9.				
k_L … … …	0·164	0·204	0·163	0·164
for lift $= n_1W - k_m$ …	0·0400	0·0531	0·0555	0·0429
k_c … … …	0·244	0·260	0·340	0·262
$\frac{R_1(b-a)}{c.n_1.W}$ … …	0·085	0·101	0·181	0·103
$\frac{R}{W}(b/c - a/c)$ … …	0·60	0·71	1·27	0·72
In dive :				
$\frac{R}{W}(b/c - a/c)$ … …	0·80	0·27	0·43	0·80

Factor of Safety $f = 1·75$. $n_1 \equiv n/f$.

P. 7.	A.	B.	C.	D.
k_L … … …	0·100	0·122	0·099	0·100
for lift $= n_1W - k_n$ …	0·0310	0·0380	0·0379	0·0325
k_c … … …	0·310	0·311	0·381	0·325
$\frac{R_1(b-a)}{c.n_1W}$ … …	0·186	0·187	0·257	0·201
$\frac{R}{W}(b/c - a/c)$ … …	1·02	1·03	1·41	1·11
In dive :				
$\frac{R}{W}(b/c - a/c)$ … …	1·05	0·61	0·53	0·99

P. 9.				
k_L … … …	0·117	0·146	0·117	0·117
$-k_m$ … … …	0·0334	0·0426	0·0430	0·0351
k_c … … …	0·286	0·292	0·368	0·300
$\frac{R_1(b-a)}{c.n_1W}$ … …	0·127	0·133	0·209	0·141
$\frac{R}{W}(b/c - a/c)$ … …	0·89	0·93	1·46	0·99
In dive :				
$\frac{R}{W}(b/c - a/c)$ …	1·12	0·38	0·60	1·12

With the notation above, $\frac{R}{W}(b/c - a/c)$ is given as under.

Coming out of a dive.

P. 7.	Factor of Safety	Full Scale A.	Model $vl = 25$ B.	Model $vl = 10$ C.	No Stagger D.
P. 7 … …	1·0	0·62	0·69	1·17	0·72
	1·25	0·75	0·83	1·25	0·85
	1·75	1·02	1·03	1·41	1·11
P. 9 … …	1·0	0·46	0·60	1·17	0·59
	1·25	0·60	0·71	1·27	0·72
	1·75	0·89	0·93	1·46	0·99
In Dive.—					
P. 7 … …	1·0	0·60	0·35	0·30	0·57
	1·25	0·75	0·44	0·38	0·71
	1·75	1·05	0·61	0·53	0·99
P. 9 … …	1·0	0·64	0·22	0·34	0·64
	1·25	0·80	0·27	0·43	0·80
	1·75	1·12	0·38	0·60	1·12

Some interesting experimental effects with regard to the orders of acceleration which might be expected in flight have been published in the Reports of the National Advisory Committee for Aeronautics (U.S.A.), 1924. The following table is abstracted from Report No. 203 :—

Power spirals … … (sustained)	4·7 g.
(Pilot experienced loss of sight.)	
Maximum … … … … …	5·5 g.
Immelman turn … … … …	4·4 g.
Vertical bank … … … …	5·7 g.
Loop start … … … … …	3·2 g.
Upside down flight … … … …	−1·2 g.
Recovering from loop … … …	4·2 g.
Spin … … … … … …	2·6 g.
Low flying in rough air over mountains …	2 g.
Rough air from convection currents	2·2 to −0·5 g.

In the case of pulling out of a dive experimental observations are given in the following table, and compare with the theoretical calculations :—

Air Speed. M.p.h.	Acceleration (Experimental).	Acceleration (Calculated).
66·3	1·3	1·35
76·0	1·6	1·78
85·6	2·1	3·25
95·3	2·7	2·79
105·0	3·3	3·40
114·5	3·9	4·04
124·0	4·6	4·74
133·6	5·3	5·50
143·3	6·1	6·32
153·0	6·4 (low)	7·22
162·5	7·8	8·15

It will be noticed that very high experimental accelerations have been measured, figures considerably in excess of those which in previous opinion a human being was capable of sustaining without loss of consciousness.

The following quotation dealing with the physical sensations of the pilot is particularly interesting. "From the results of these tests, it is apparent that serious physical disorders do not result from extremely high accelerations of very short duration, but that accelerations of the order of

4·5 g. continued for any length of time, result in a complete loss of faculties. This loss of faculties is due to the fact that the blood is driven from the head, thus depriving the brain tissues of the necessary oxygen. To the pilot it seemed that sight was the only faculty that was lost. The flight surgeons, McCook Field are of the opinion that sight is the last faculty to be lost under these conditions, even though the pilot may be under the impression that he retains all the others. This opinion is based on the observation of men undergoing rebreather test. The acceleration which an individual can withstand for any length of time depends upon his blood pressure, the person with the higher blood pressure being able to withstand the higher acceleration. Upon the condition of the heart depends the ability of the individual to recover quickly from the effect of prolonged acceleration. If the heart is in good condition, there is no danger in undergoing such a strain unless the acceleration is continued for a period in excess of 10 or 12 minutes, after which death will result. The same is true of the rebreather test; unconsciousness will result from the deprivation of oxygen and death will result if this is continued for the same length of time."

It is also interesting to note that according to this Report the physical effect of the accelerations in rough weather, not being associated with definite actions on the part of the pilot appear to be much more severe than the actual figures would indicate.

(To be continued.)

SPINDLED AND HOLLOW SPARS.

By Lieut.-Col. J. D. BLYTH, O.B.E., M.I.AE.E., late R.A.F.

The most usual method of arriving at the maximum amount of spindling or hollowing out permissible in the case of any particular spar section is by trial and error, a process which is apt to become laborious in the absence of good guessing—or luck. The following tables have been got out with the object of making it possible to arrive with certainty at a suitable section at the first attempt.

The following symbols are employed:—

I = Moment of inertia.
Z = Section modulus.
M = Bending moment.
T = Torque.
S = Shear force.
f_c = Ultimate compressive strength of material.
f_t = „ tensile „ „
f_s = „ shear „ „

We will first consider a spar of rectangular section, laterally loaded only, which we wish to spindle to either I, ⊐, or □ section.

B = Width of section.
D = Depth of section.
d = Thickness of flange.
t = Thickness of web.

It should be noted that in the case of the hollow □ section, t is the combined thickness of the walls forming the web.

The most rapid method gives flange and web thicknesses slightly greater than are actually required, so the spar will be on the safe side. The procedure is as follows:—

First find t, the thickness of the web. This is given by

$$t = \frac{3}{2\,\mathrm{D}} \cdot \frac{\mathrm{S}}{f_s}.$$

Next find the value of C, which is given by

$$\mathrm{C} = \frac{\mathrm{M}}{f_c \mathrm{Z}}$$

$$\text{where } \mathrm{Z} = \frac{\mathrm{BD}}{6}$$

In Table I, values of λ are tabulated for values of C from 0 to 1·0.

$$d = \lambda \mathrm{D}.$$

TABLE I.—*Values of λ for all values of C. Rectangular Sections.*

C	0	1	2	3	4	5	6	7	8	9
·0	0	·002	·004	·005	·007	·009	·010	·012	·014	·016
·1	·017	·019	·021	·023	·025	·027	·028	·030	·032	·034
·2	·036	·038	·040	·042	·044	·046	·048	·050	·052	·054
·3	·056	·058	·060	·063	·065	·067	·069	·072	·074	·076
·4	·079	·081	·083	·086	·088	·091	·093	·096	·098	·101
·5	·103	·106	·109	·111	·114	·117	·120	·123	·126	·129
·6	·132	·135	·138	·141	·145	·148	·151	·155	·158	·162
·7	·166	·169	·173	·177	·181	·185	·190	·194	·198	·203
·8	·208	·213	·218	·223	·229	·235	·241	·247	·254	·261
·9	·268	·276	·285	·294	·305	·316	·329	·345	·365	·393
1·0	·500	—	—	—	—	—	—	—	—	—

The method will be made clear by taking an example and working it out.

Suppose we have a spar whose section is 2 in. wide and 4 in. deep,

M = 16,000 lb.-in.
S = 900 lb.
f_c = 5,500 lb. per square inch
f_s = 800 lb. per square inch.

The spar is to be spindled to I section.

We get $t = \frac{3}{8} \times \frac{900}{800} = 0{\cdot}42$ in.

and Z = 5·33
whence C = 0·545.

From Table I we see that when C = ·54, λ = ·114, and when C = ·55, λ = ·117. Interpolating in these values we get a value in the present case,

$$\lambda = {\cdot}116$$
$$d = \lambda \mathrm{D} = {\cdot}464 \text{ in.}$$

Remembering that the values found are on the high side, we will make the flanges 0·45 in. deep, and the web 0·4 in. thick.

Checking the section so obtained we find that we have for bending a factor of safety of 1·15, and for shear a factor of safety of 1·14.

The section found in this way will be suitable in most cases. Occasions may arise, however, when it is desired to lighten the spar as much as possible, *i.e.*, to spindle it to the limit. In this case the procedure is a little longer.

First find t as before.

Next find the value of $\frac{f_c t \mathrm{D}^2}{6}$, and subtract the value so found from the known value of M. Calling the remainder M′, find the value of C, which in this case is given by

$$\mathrm{C} = \frac{\mathrm{M}'}{f_c \mathrm{Z}'}$$

where $\mathrm{Z}' = \frac{(\mathrm{B} - t)\mathrm{D}^2}{6}$.

Look up the value of λ in Table I; and as before, $d = \lambda \mathrm{D}$.

Taking as an example the spar already described.

As before, t = 0·4 in.

$$\text{Then } \mathrm{M}' = \mathrm{M} - \frac{5{,}500 \times 0{\cdot}4 \times 16}{6}$$

= 10,150 lb.-in.
Z′ = 4·27
C = ·433
whence λ = ·087, and d = 0·35 in.

This section has for bending a factor of safety of 1·01.

We will next consider a spar of rectangular section, laterally loaded as before, together with an end load P. In this case the procedure is divided into two steps, as follows.

First find the section neglecting end load, in the manner already described: and let A sq. inches be the area of the section so found. This enables us to find the value of $\frac{\mathrm{P}}{\mathrm{A}}$.

Repeat the process, using the value $f_c - \frac{P}{A}$ instead of f_c, or, where applicable, $f_t + \frac{P}{A}$ instead of f_t. It should be noted that for compressive end loads the numerical value of P is taken as positive, while if the end load is tensile the numerical value of P is negative.

Taking as an example the spar already worked out, and supposing that it is subjected to a compressive end load of 1,000 lb.

Neglecting the end load, we have as before

$$t = 0 \cdot 4 \text{ in.}$$
$$d = 0 \cdot 45 \text{ in.}$$

We get $A = 3 \cdot 04$ sq. in., and $\frac{P}{A} = 329$.

New value of $f_c = 5{,}500 - 329 = 5{,}171$.

Since the shear stress is unaffected by the end load, t remains as before.

$$C = \frac{16{,}000}{5{,}171 \times 5 \cdot 33} = 0 \cdot 58$$

whence $\lambda = 0 \cdot 126$

and $d = 0 \cdot 5$ in.

This section has a factor of safety of $1 \cdot 13$.

If the Perry correction is to be applied the method is similar. In this case the section is found as before, and the value of $f_c - \frac{P}{A}$ derived, and also the value of P_e, the Euler load for the spar treated as a strut for the length of the portion between points of contraflexure. Now multiply M by $\frac{P_e}{P_e - P}$ and with the new values of M and f_c proceed as before.

We now turn to spars of circular section. These are most commonly subjected to a lateral load, combined with a torsional load: and this case we will consider, first taking the case of wooden spars, where the thickness t of the wall is not small compared with the diameter D (this being the external diameter).

The procedure is as follows :—

First find T_e, the equivalent torque. This is given by

$$T_e = \sqrt{M^2 + T^2}$$

Next find the value of C, which is given by

$$C = \frac{16\, T_e}{\pi D^3 f_s}$$

Turn to Table II, and find the value of λ corresponding to the value of C.

Then $t = \lambda D$.

TABLE II.—*Values of λ for all Values of C.*

Circular Sections.

C	0	1	2	3	4	5	6	7	8	9
·0	0	·001	·003	·004	·005	·006	·008	·009	·010	·012
·1	·013	·014	·016	·017	·019	·020	·021	·023	·024	·026
·2	·027	·029	·030	·032	·033	·035	·036	·038	·040	·041
·3	·043	·045	·046	·048	·050	·051	·053	·055	·057	·058
·4	·060	·062	·064	·066	·068	·070	·072	·074	·076	·078
·5	·080	·082	·084	·086	·088	·090	·093	·095	·098	·100
·6	·102	·105	·108	·110	·113	·116	·118	·121	·124	·127
·7	·130	·133	·137	·140	·143	·147	·150	·154	·158	·162
·8	·166	·170	·175	·179	·184	·189	·194	·200	·206	·212
·9	·219	·226	·234	·243	·250	·264	·277	·292	·312	·342
1·0	·500	—	—	—	—	—	—	—	—	—

In employing this method it must be remembered that the wall thickness found is not greater than is actually required; and further, is only that required to resist the shear stress due to torsion, no account having been taken of the shear stress due to direct shear. In the case of such spars the shear stress due to direct shear is not usually high, and with a little practice it will be found easy to estimate the amount (which is very small) by which the computed value of t must be increased for safety.

In the case of circular metal spars, where the thickness of the wall is small compared with the outside diameter, the required thickness t is given at once by

$$t = \frac{2}{\pi D^2} \cdot \frac{T_e}{f_s}.$$

No examples have been given in the case of spars of circular section, as it is thought that the examples worked out in the cases of spars of rectangular section show the method sufficiently clearly.

TECHNICAL LITERATURE.

A.R.C. REPORTS.

THE REDUCTION OF AIRCRAFT PERFORMANCE TESTS.

By R. S. CAPON, B.A., OF THE AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT, MARTLESHAM, WITH AN APPENDIX BY W. G. JENNINGS, B.SC., OF THE R.A.E., AND F/O FALKNER, OF THE R.A.F. PRESENTED BY THE DIRECTOR OF SCIENTIFIC RESEARCH.

R. & M. No. 985 (Ae. 197) (20 pages and 13 diagrams). June, 1925. Price 1s. 3d. net.

Two methods of analysing aircraft performance tests have been described, one in R. & M. No. 474 and the other in T. 1929.* Both aim at the derivation of complete information as to overall lift, drag and airscrew coefficients, and as this is strictly unobtainable from climbs and speeds, both methods necessarily rely on extraneous data. To supply the additional information the assumption is made in both that overall coefficients may be used, and some geometrical approximations are made. The accuracy of air tests (see §. 9) is such that there appears to be risk of introducing errors greater than the errors of observation in allowing the above assumptions and approximations, particularly with respect to the generalised airscrew curves.

A system of tests and method of analysis is described which enables all the information as to overall aircraft and airscrew coefficients obtainable from climbs and speeds to be derived without the use of the generalised airscrew curves or other extraneous data, and which enables it to be ascertained without additional work if the use of overall coefficients is legitimate. Two forms of the reduction are described. One avoids all geometrical approximations, but involves measuring the angle between the airscrew axis and the horizontal. The other, intended for use when limited information only is required, does not require the measurement of this angle, and therefore necessarily includes certain geometrical approximations. It is shown how, when overall coefficients are found to be inapplicable, the method may be used to present the data of the tests in a convenient form for further analysis.

Examples illustrating the various forms of the reduction are given from tests carried out at Martlesham.

The proposed method of reduction requires no approximations or assumptions, and therefore utilises the full accuracy of the observations. By separating to a great extent aircraft and airscrew characteristics, it facilitates the separate comparisons of airscrews and aircraft, and from the form in which results are presented it enables performances at other loads to be quickly arrived at.

It is proposed to carry out further tests to ascertain the accuracy with which predictions may be made by the methods described of the effect on performance of a change of load, airscrew, or engine.

* Unpublished.

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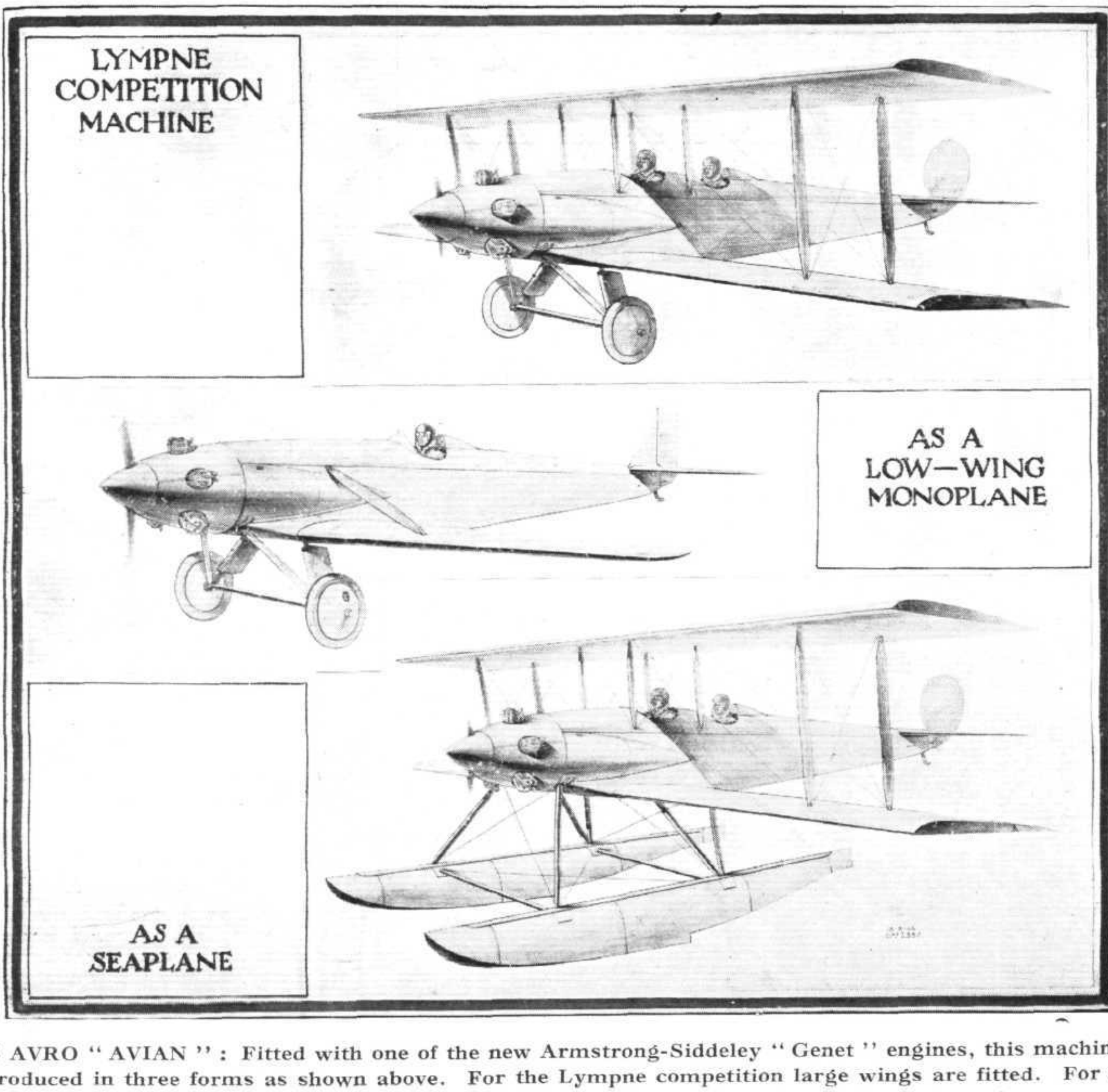
THE AVRO "AVIAN"

65 H.P. Armstrong-Siddeley "Genet" Engine

IN designing a machine especially for the forthcoming Lympne Light 'Plane Competition for prizes offered by the *Daily Mail* and others, there are two lines along which the problem of gaining the highest number of points may be attacked: one is to carry no more than the useful load of 340 lbs. stipulated as a minimum, and to use for the carrying of this load the smallest power plant which can be counted upon to get the machine around the 2,000 miles' course at an average speed of not less than 50 m.p.h., tuning the engine to use as little fuel as possible; the other consists in taking as a starting-point the most powerful engine available within the maximum weight allowance of 170 lbs., and designing for it a machine which will carry considerably more than the 340 lbs. useful load. In between these two extremes there are, of course, a number of combinations possible. Mr. Chadwick, chief designer and engineer to A. V. Roe and Co., Ltd., has chosen to follow the latter course, partly as offering the best solution for the competition, but equally because in so doing a machine is, he considers, produced which is of a type likely to be practically useful to clubs, private owners, etc., quite apart from competition considerations.

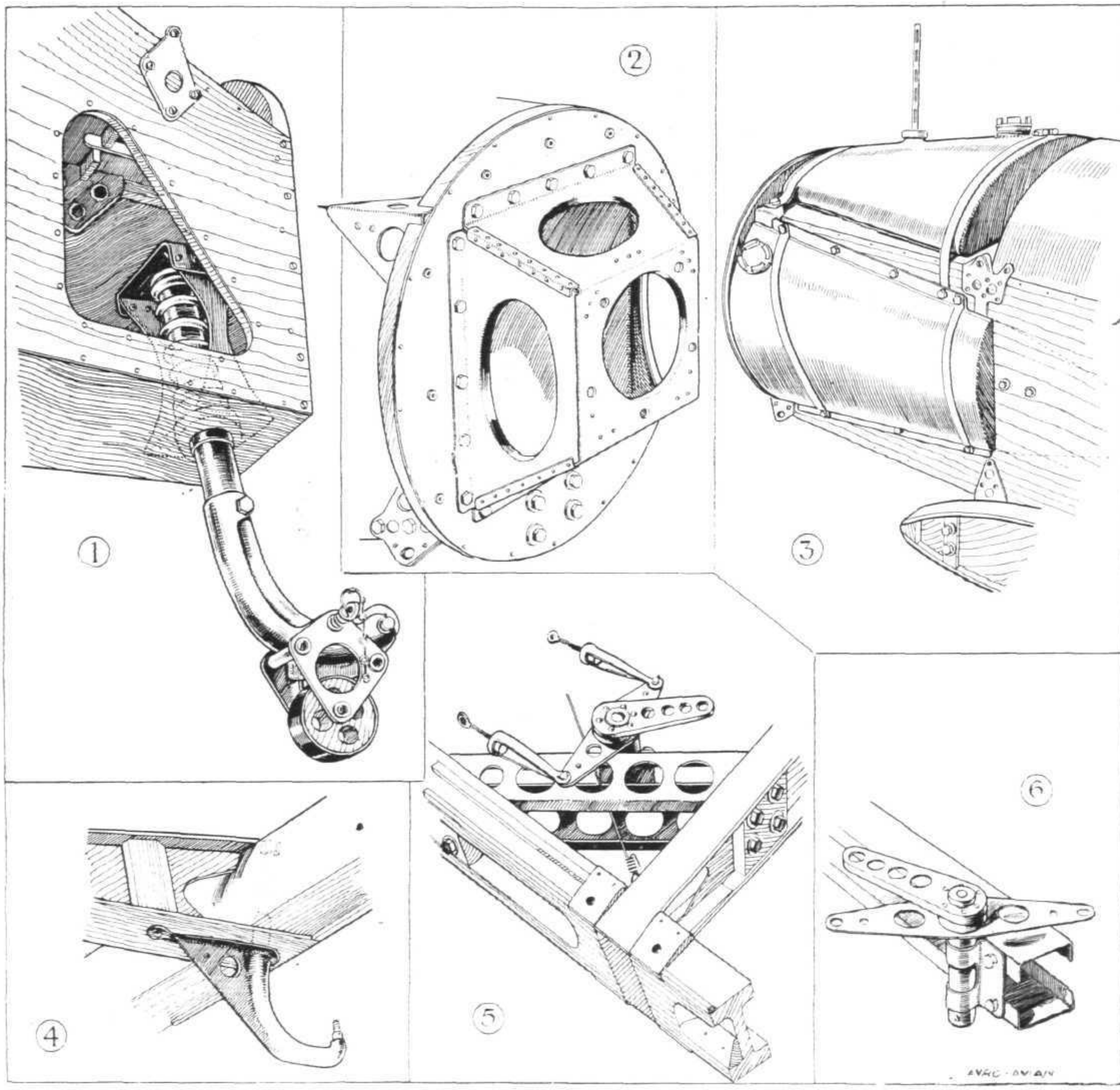
From the Lympne competition point of view, the Avro "Avian," as the new machine is called, is characterised by very low structure weight and great load-carrying capacity, while with future production in mind, the detail construction is of the simplest imaginable form without departing radically from normal practice. There are rumours of a new Ford "runabout" in which the fuselage is to be built up from stamped-out sides, tops and bottoms, and wings in which the top and bottom surfaces are also stamped out in one operation; but until the day comes when aeroplanes can be produced in thousands the plant necessary to do this is likely to be expensive, and Mr. Chadwick has not quite gone to this extent in his search for cheapness of production. As regards its suitability for "point-getting" at Lympne, it may be stated, although very accurate figures are not yet available, that the "Avian" has an estimated empty weight of round about 750 lbs., while its total loaded weight, within the airworthiness certificate, will be rather more than double that figure. As the longest distance to be covered in the competition without landing is something like 124 miles, the fuel to be carried must be sufficient for this distance plus a margin for head winds, etc. This means that the quantity of fuel to be carried will be fairly considerable, but a rough estimate indicates that the point-scoring load which the "Avian" will be able to carry may be somewhere in the neighbourhood of 750 lbs. To enable the machine to pass the take-off and pull-up tests in the eliminating trials with a total



THE AVRO "AVIAN": Fitted with one of the new Armstrong-Siddeley "Genet" engines, this machine will be produced in three forms as shown above. For the Lympne competition large wings are fitted. For speed rather than load-carrying, the upper wing is removed and the machine turned into a low-wing monoplane. Finally, it is proposed to fit it with floats for seaplane work.

loaded weight of something like 1,580 lbs., wings of large area will, obviously, be necessary, and those of the " Avian " as used in the competition will have an area of no less than 294 sq. ft., which will give a wing loading of in the neighbourhood of 5·375 lbs./sq. ft., a figure which should allow the machine to " unstick " satisfactorily. For the same total loaded weight the power loading (based upon normal power) will be 24·3 lbs./h.p. As the " Genet " engine develops a fact may be accepted as sufficient proof of the strength of the machine.

Before turning our attention to the details of the construction of the Avro " Avian," it may be of interest to mention briefly that the machine will be produced in three distinct forms after the competition. Firstly, there is the standard form, possibly with wings of somewhat smaller area than those used in the competition, but otherwise identical with

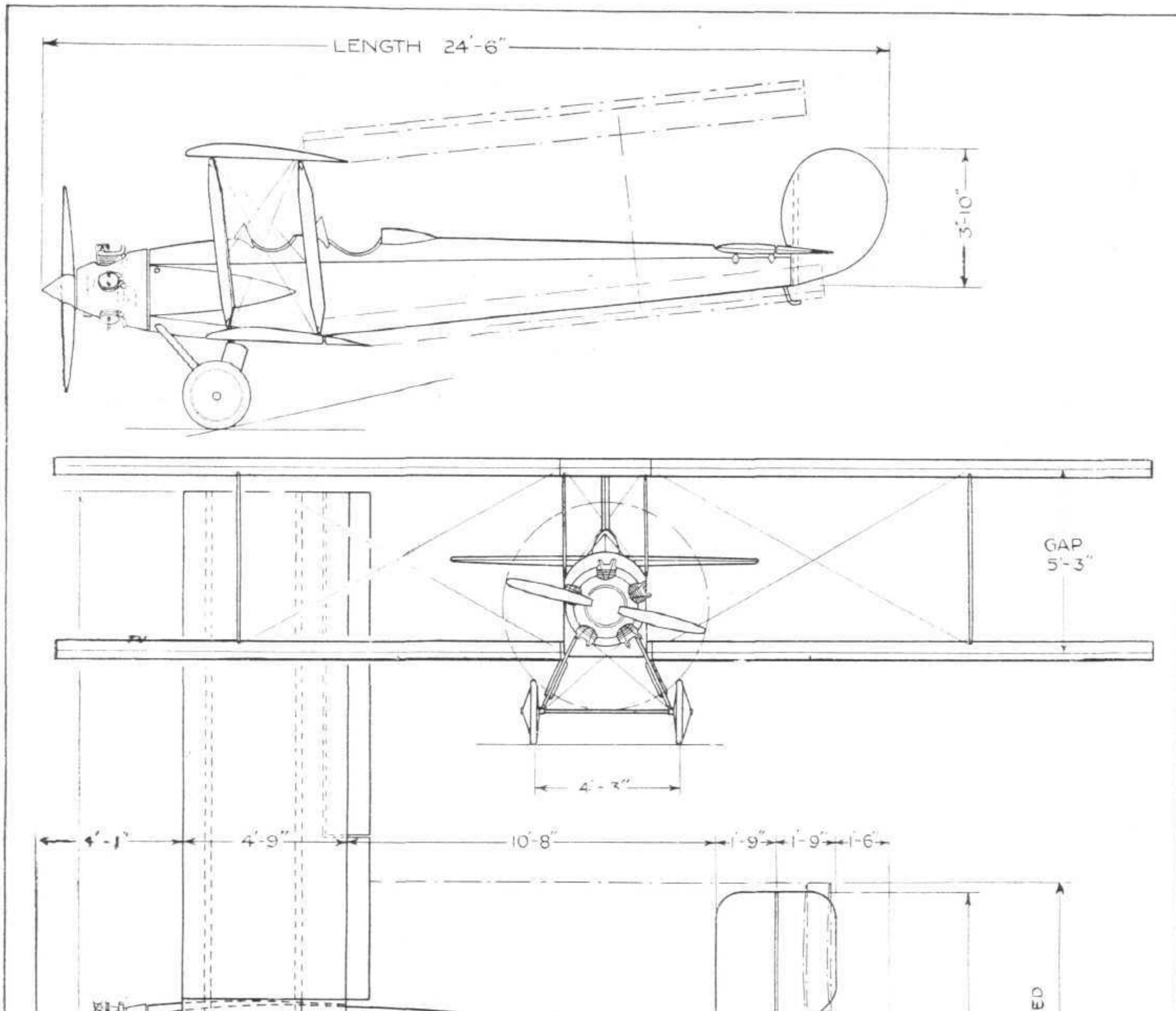


[" FLIGHT " *Copyright Sketches*

THE AVRO " AVIAN " : 1, Shows the tail skid with its small detachable roller, while the very light engine mounting is shown in detail in 2. The petrol and oil tanks are mounted on the top and side respectively of the fuselage as indicated in 3. The wing flap crank lever is illustrated in 4, and the differential aileron controls in 5 and 6.

maximum of 75 h.p. for short periods, the power loading for taking-off purposes is reduced to just over 21 lbs./h.p., so that with the relatively low wing loading the machine should clear the two 25-ft. barriers without difficulty.

A ratio of empty weight to total loaded weight of less than 0·5 is, of course, extraordinarily good, and indicates very great care in detail design. Lest it should be thought by those not intimately acquainted with Avro standards of construction that such a ratio necessarily means a flimsy structure, we would point out that the factors of safety are such that the machine will be eligible for the " aerobatics " airworthiness certificate of the British Air Ministry, which the competition machine. For the Grosvenor Cup race, and for anyone wanting a faster machine than the normal, the " Avian " will be supplied as a low-wing monoplane, with a single strut bracing the wing to the top of the fuselage, as shown in a sketch. Finally, the machine will be " put on floats," when it will have the normal biplane wings. This form also is shown in a sketch. It will thus be seen that the Avro " Avian " should prove a low-powered aeroplane with many applications and suitable, by some very simple substitutions, for a variety of uses. The detail construction is such as to make for cheap production, and we understand that after the Lympne meeting it is intended to market the



THE AVRO "AVIAN," ARMSTRONG-SIDDELEY "GENET" ENGINE: General arrangement drawings, to scale.

"Avian" at a price which should appeal strongly not only to light aeroplane clubs, but also to private owners.

Constructional Features

From the fact that it is designed for cheap production one expects the Avro "Avian" to be a very straightforward piece of construction, and during a visit to the Avro works at Hamble last week we were able to determine that this is indeed a fact. So much so, that one might easily fall into the error of dismissing the machine as being perfectly simple and normal, and therefore of no particular interest. In doing this one would not only be unfair to the machine but one would miss an opportunity to appreciate the extent to which the simplicity evident everywhere is due to the very greatest care and thought in design. A close inspection of the details of the construction leaves one with the feeling that the designer had made up his mind at the start that every member was to be as simple and as light as possible, and that such few metal fittings as are used should be of a form that could be produced at an absolute minimum of cost.

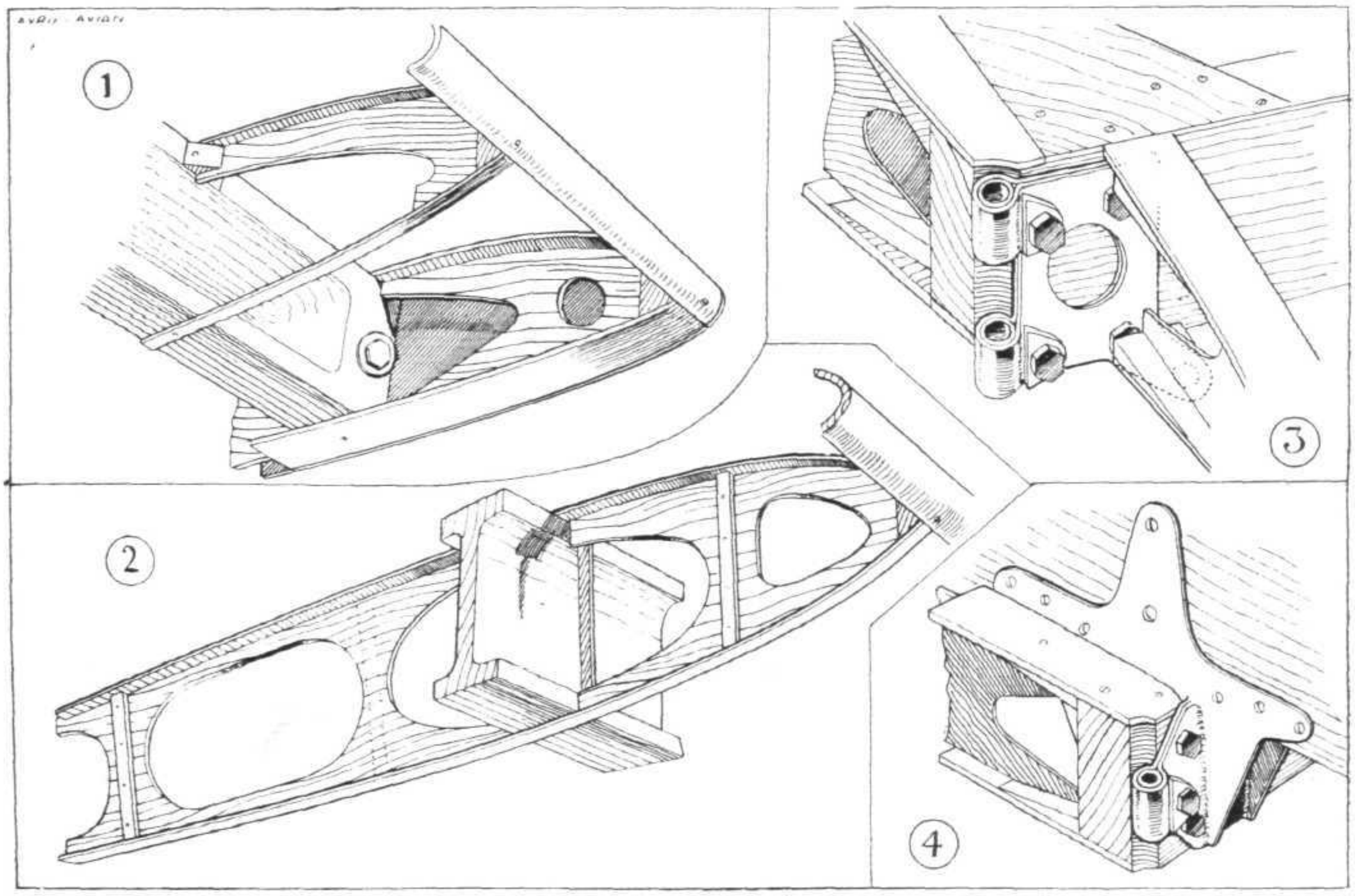
The Fuselage

The fuselage of the Avro "Avian" is of the "box" type, with a light skeleton framework covered with very thin three-ply wood. It is of very light weight, but from his stress estimates of it Mr. Chadwick is prepared to class it as strong enough for an engine of twice the power of the "Genet." The struts are attached to the longerons by small three-ply gussets as well as by the ply-wood covering, of course, and the flat sides are surmounted by a curved deck, while the bottom is flat. In the nose the covering is in the form of an aluminium cowl which fairs the radial engine into the flat sides and bottom of the fuselage. On the port side this cowl is formed by the oil tank, which thus is exposed to the air and forms an oil cooler. Above the nose of the fuselage is mounted the petrol tank, which has a very large sump, and is also shaped to conform to the lines of the body.

The fuselage is fairly wide. In fact, we understand that Mr. A. V. Roe was rather perturbed when he discovered that it was a whole $2\frac{1}{4}$ in. wider than it need be according to the competition regulations. However, the cockpits are certainly very comfortable, and it is doubtful whether the good shape obtained with the fuselage as it is could have been improved upon by saving the extra width. Dual controls are fitted, and are of a very ingenious type, in which the control unit, as far as the two inter-connected sticks are concerned, is built up on the bench and is then slipped into the fuselage and secured as a unit by a few bolts. In the case of the foot bars for the rudder, these are also interconnected and, like the sticks, mounted on two longitudinal beams resting on the floor of the cockpits. Hinged pedals are employed, which are pivotted to the actual transverse bars in such a way that they do not alter their angle thus avoiding any risk of the feet slipping off. Metal troughs on the floor guard the floor boards against wear by the heels of the occupants. The two fore and aft beams also carry the seats.

The Wings

The wings of the "Avian" are, as already stated, of large area, having a span of 32 ft., and a chord of 4 ft. 9 in. In spite of the large span there is but one pair of inter-plane struts on each side, so that the length of unsupported spars is considerable. The main spars themselves are of spruce, spindled out to an I section, this form of construction being cheaper, in labour costs, than a built-up box spar, while the small over-all size does not call for spruce planks of prohibitive cost. In order to make all ribs alike square wing tips are employed. In this country one does not usually find square wing tips, but on the other hand the French Farman machines all have this form of tips with, apparently, no serious effect on efficiency. At any rate at the speeds which the "Avian" is meant to attain there is probably little lost, while the cost is very much reduced. The ribs are of simple type, the construction being illustrated in some of our sketches. Owing to the parallel wings all the ribs are alike, those in the lower wing which fall in front of the ailerons being the standard, but with the tail cut off and used in the wing flaps. All wing fittings are of very simple type, including the fittings for the inter-plane struts, top centre-section struts, &c. Ailerons are fitted to the bottom wing only, this arrangement having the double advantage that in the biplane form of the machine the flaps are easily accessible, while the change-over to low-wing monoplane does not necessitate any interference with the normal controls. Special cranks giving a differential



["FLIGHT" *Copyright Sketches*

THE AVRO "AVIAN": Some constructional details of the wings. 1, Shows the very simple rib construction and leading edge, while in 2 is shown a complete rib, the spar section, and the leading edge. The hinges for folding the wings are of simple type, as shown in 3, with ample bearing areas. The wing root on the fuselage, with steel plate fitting and hinge, is shown in 4.

movement to the flaps are used, and take the form shown in a sketch. Needless to say, the wings are made to fold, and the hinges used for this operation are like all the rest of the fittings, of the simplest possible type.

Undercarriage

The undercarriage is of simple Vee type, with rubber blocks in compression forming the shock absorbing medium. The chassis is extremely light for the loaded weight of the machine. No definite figures are available, but when picked up the chassis appeared to weigh but three or four pounds. The tail skid is similar to that used in the Avro "Avis," but an addition to it has been made in the form of a small detachable roller, the purpose of which is to enable the machine to be wheeled, with wings folded, through the "theoretical" shed without the necessity of a man struggling with the tail, which is necessarily heavy with the wings folded.

Power Plant

The Armstrong-Siddeley "Genet" engine is mounted on an extremely light engine plate of Duralumin, the form and details of which are shown in one of our sketches. Owing to the fact that most of the engine accessories in the "Genet" are placed in front, there is little need to get at the back of the engine, although the engine plate used enables this to be done with great ease if necessary. As the petrol tank is in the top fairing, direct gravity feed can be used, with consequent simplicity of the petrol system. For the competition the "Genet" will be fitted with a single magneto, as the addition of a second would bring the total weight up to more than the 170 lb. stipulated as a maximum. After the competition, however, dual ignition will be fitted as standard, the necessary provision for this having been made in the engine.

The main dimensions of the Avro "Avian" are shown on the general arrangement drawings on p. 535. It is only necessary to add that the weight empty is in the neighbourhood of 750 lb., while the total loaded weight is approximately 1,580 lb. Concerning performance no information can be given for obvious reasons, but in spite of its large area the "Avian" is a clean design and should do well.

LIGHT 'PLANE CLUB DOINGS

London Aeroplane Club

THE total flying time up to August 19 was 19 hrs. 50 mins. The following members were given flying instruction: O. E. Martin, Miss O'Brien, A. Southgate, C. K. Tutt, G. H. Craig, R. Malcolm, Major K. M. Beaumont, J. P. Simson, F. C. Elford, A. J. Richardson, H. Solcmon, E. A. Lingard, V. H. Doree, E. D. Moss, G. E. Clair, R. C. Woodcock, D. L. Stalley, A. L. A. Petty, H. F. Wight, C. E. Murrell, W. Hay.

The following members flew solo: W. Hay, Major K. M. Beaumont, Miss O'Brien, Squad.-Leader M. E. A. Wright, R. Malcolm, O. J. Tapper, E. D. Moss, E. S. Brough, G. H. Craig.

Joy rides were given to Mrs. Lamplugh, Mrs. Lohmeyer, Mrs. Wright, G. W. West.

Bournemouth Race Meeting.—The London Aeroplane Club won the Pilot Instructors' Race (Capt. F. G. M. Sparks) and the Light Aeroplane Club Members' Scratch Race (Mrs. Eliott-Lynn). In the Bomb-Dropping Competition, Capt. Sparks and G. H. Craig tied on the first day and Capt. Sparks was again successful on the second day.

Hampshire Aeroplane Club

REPORT for week ending August 21. Total flying time, 10 hrs. 33 mins.; instruction flying, 7 hrs. 47 mins.; passenger flying, 2 hrs. 46 mins.

The following members received instruction: Messrs. Perfect, 1 hr. 30 mins.; Fry, 1 hr. 20 mins.; Bound, 1 hr.; Nicholson, 30 mins.; Burry, 22 mins.; Dobson, 20 mins.; Southcliffe, 20 mins.; Keeping, 20 mins.; Kerry, 15 mins.; Sommer, 15 mins.; Courtenay, 15 mins.; Cooper, 5 ; Wing-Commander Wyllie, 15 mins.; Major Jenkins, 45 mins.; Flying Officer Clarkson, 5 mins.

The following members received passenger flights: Miss Hewitt, 7 mins.; Mrs. Smith, 10 mins.; Mrs. Potter, 10 mins.; Messrs. Kelly, 12 mins.; Thake, 12 mins.; Gaston, 12 mins.; Pipe, 12 mins.; Taleron, 14 mins.; Belleville, 10 mins.; Salter, 7 mins.; Miss Edward, 10 mins.

On Saturday, August 21, G-EBOH and G-EBOI were flown to Bournemouth for the race meeting, Capt. Thomson flying "Gee-bo," with Mr. R. V. Perfect, the club's hon. assistant secretary, as passenger; and Flying Officer R. H. Stocken flying "Gee-boy," with Mr. McCracken, ground engineer, to the club.

Capt. Thomson flew "Gee-bo" in the instructors' race, and led the field in the manner of the Duke of Plaza Toro.

He then flew back to Hamble in "Gee-boy" to carry on with instructing, and F/O Stocken flew "Gee-bo" in the Christchurch sprint race.

Mr. Stocken decided to turn this race into a botanical ride, and perceiving a rare species of *Quercus robur pedunculata*, known to the "οἱπλλοι" as an oak, he proceeded to plunge into its foliage. Very fine specimens were obtained on the lower port plane and undercarriage, and having satisfied himself on this point, he joined once again in the race.

This passion at a certain service station for the "extra leaf" is a most interesting phenomenon.

Lancashire Aero Club

THE weather has been exceptionally bad, rain and strong winds, at times reaching gale force, have been ruling almost every day. Mr. Stack gave instructions to Messrs. Costa, 2 hrs. 35 mins.; Nelson, 1 hr. 10 mins.; Wade, 50 mins.; Fallon, 45 mins.; Collinson, 35 mins.; Heys, 30 mins.; Fray, 30 mins.; Pitman, 25 mins.; Foxcroft, 25 mins.; Leigh, 25 mins.; Anderson, 15 mins.; total, 8 hrs. 20 mins.

Mr. Cantrill gave instruction to Messrs. Shires 30 mins., Hay 10 mins.; total, 40 mins.

Solo flights by Messrs. Leeming 2 hrs. 15 mins.; Hardy, 1 hr. 30 mins.; Nicholson, 45 mins.; Goodfellow, 35 mins.; Agar, 35 mins.; Leete, 20 mins.; total, 6 hrs. 20 mins. Tests occupied 1 hr. 20 mins.; total hours flown during week, 16 hrs. 40 mins. Mr. Hardy made the required flights for his certificate on Tuesday. The machines in use have been L-V and M-Q ("Moths"), and O-K (80 Renault Avro). L-R is being overhauled. The "Gosport," except for an occasional test, is not flown, and until a new engine is obtained it will probably remain unused. The present engine is too erratic to trust with anyone but a highly-skilled instructor flying within gliding distance of the 'drome.

Midland Aero Club

REPORT for week ending August 28. A continuance of very stormy weather throughout the week has considerably restricted flying operations. The total flying time was 8 hrs. 10 mins.

The following members received flying instruction: J. Brinton, E. J. Brighton, C. H. Burrows, R. L. Jackson, H. Smith, S. H. Smith.

The following members made solo flights: C. L. Knox, R. L. Jackson, E. J. Brighton, G. H. Perry.

On account of the attendance of Capt. McDonough at the Bournemouth Aviation Meeting, no tuition work was carried out over the week-end. The machine sent to Bournemouth put up a consistent performance, but suffered from a "woolley" engine, which had only been installed after a complete overhaul two days before the meeting opened.

Mr. E. L. Brighton, in the Pupils' Race, made an excellent and spectacular "get-away," which gave him a lead of about half a mile, though he unfortunately lost this by missing the first turning point.

Capt. McDonough was successful in obtaining second place in the Instructors' Race.

Newcastle-upon-Tyne Aero Club

REPORT for week ending Sunday, August 22. Very bad weather was experienced throughout the week and flying was possible on only three days.

The total time was 14 hrs. 15 mins., all on LY, LX being off service for overhaul and renewal of C. of A. Dual, 12 hrs.; solo, 30 hrs.; and "A1" pilots, 1 hr. 45 mins.

The following members flew under instruction with Mr. Parkinson: Messrs. Gilmore, V. S. Davidson, J. M. Davidson, Thirlwell, Bruce, Middleton, H. Ellis, Turnbull, E. C. Kennedy, J. Y. M. Kennedy, Prendergast and Mrs. Marcks. Dr. Dixon flew solo.

Mr. N. S. Todd flew with Mr. A. Bell as passenger.

Mr. C. Thompson flew with the following as his first passengers: Mrs. Thompson, Mr. Thompson, Mrs. Ridley and Mr. L. Smith.

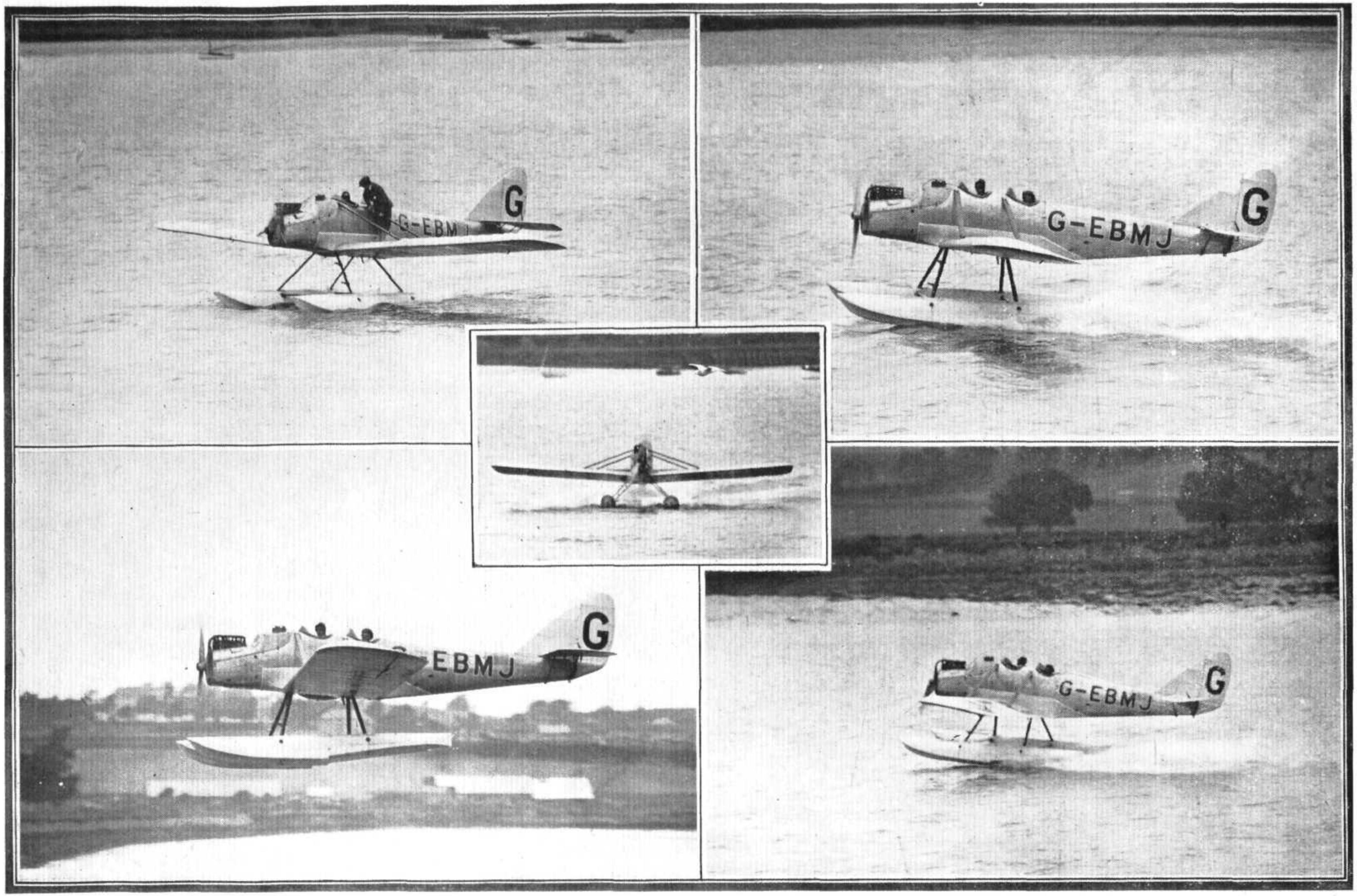
Mr. Graham and Mr. Goodbody had joy rides with Mr. Parkinson.

NEWCASTLE AERO CLUB FLYING MEETING

THE Newcastle-upon-Tyne Aero Club will be holding its first flying meeting, at Cramlington Aerodrome, on September 4. We give below a programme of events to be held at this meeting. If it can be arranged to the convenience of competitors it is proposed to hold an "On to Cramlington" race. This will take the form of a handicap race, timed from the competitors' own aerodrome, or from some landing ground nearer Cramlington. The De Havilland Co. have very kindly offered to carry out the handicapping. We are asked to state that it will greatly facilitate the arrangement of this race if intending entrants will notify the Newcastle Aero Club of their intention.

All machines should be on the Cramlington Aerodrome by noon on the day of the race, and in arranging the above race, efforts will be made to arrange the starting times to allow of this. The list of events is as follows:—

1. *Exhibition Flying by Captain H. S. Broad, A.F.C.* 2. *Inter-Club Instructors' Race.* (Scratch). Length of Course approximately 20 miles. 3. *Private Owner's Race.* Scratch race, unless any entrant flies a machine other than a "Moth." 4. *Open Handicap.* Machines handicapped according to Royal Aero Club Formula. 5. *Exhibition Flying* by a Member trained by the Newcastle Aero Club. 6. *Inter-Club Relay Race.* Three members from each Club, including Instructor, if necessary. Take off from Starting Line on First Lap. 2nd and 3rd laps—machine left into wind where it comes to standstill and next member takes off from that position. 7. *Landing Competition.* Shortest Pull Up over given Line. Engine must be shut off, on throttle, at not less than one hundred feet. Marks given for method of approach etc. Open to Club Pilot Instructors and "A" Licensed Pilot members with over 20 hours' solo flying. Not more than three entries per Club. 8. *Bomb-dropping Competition.* Two entries maximum per Club. 3 Bombs per entrant. Nearest to given mark on Aerodrome. Bombs not to be dropped at a height less than one hundred feet. 9. *Inter-Club Members' Race.* Open to one member from each club, trained wholly by their respective clubs. Scratch race, but starting at half-minute intervals.



["FLIGHT" *Photographs*

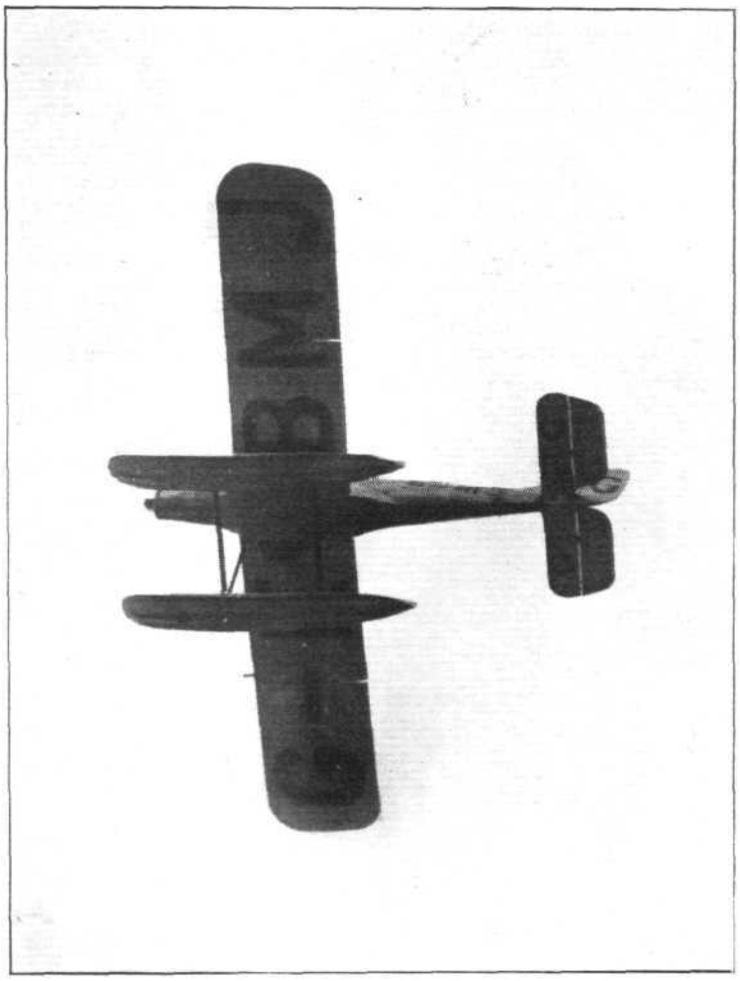
THE SHORT "MUSSEL" TWO-SEATER SEAPLANE, 65 h.p. "Cirrus" Engine: These photographs show the machine at rest on the sea, taxying before taking off, in flight, and alighting. In the inset, an inquisitive gull has a look at its mechanical counterpart. (See also p. 539.)

THE SHORT "MUSSEL" LIGHT SEAPLANE

A Two-Seater Performing Well on but 65 B.H.P.

In our issue of March 11, 1926, we described and illustrated a little two-seater light seaplane, the S.7, designed and constructed by Short Brothers of Rochester. At the time the machine was still in course of construction, and so flying pictures and the like could not be given. The machine has now, however, been finished and some "teething troubles" experienced in the beginning have, so far as we are able to judge, been entirely overcome. In view of the fact that rumours had got about to the effect that this machine was underpowered for a seaplane, that it would not get off in a calm, that its ceiling was about 100 ft. and similar ridiculous allegations, perhaps we may be forgiven for referring to this subject in rather more detail than would otherwise be necessary.

When "motor gliders" first came on the scene the question that very naturally arose was whether or not such low-powered aircraft could be got over the "hump speed" when designed as seaplanes. On the face of it this did not seem likely, the power reserve being rather small. In the meantime, however, the power of light 'planes has increased considerably over and above what was once thought necessary and the light 'plane clubs are using "Moths" with 65 h.p. "Cirrus" engines. The advent of this engine very naturally opened up once more the question of the low-power seaplane and Short Brothers, with many years' experience in seaplane design behind them, were among the first to tackle it seriously, having already produced, in the "Cockle" with two Blackburne "Tomtit" engines, a little seaplane with an excellent performance for the power. The "Mussel" as the S.7 is called, was produced for the "Cirrus" engine, and it may be stated that in this instance rumour was based upon a certain amount of fact, although naturally the "Mussel" was by no means as hopeless as alleged. The climb was not spectacular at first. Neither was the get-off. It was suspected that an unsuitable propeller might be partly responsible, but although improvements were effected by different propellers the machine was still not what it ought to be. The next step was to cover up the rather abrupt angles where the low monoplane wing met the fuselage. A light fabric fairing was attached, changing sharp angles into flat and smooth curves, and when the machine was next tested its speed, climb and get-off were improved out of all recognition. We mention this as a very interesting example of the importance in aircraft design of the interference effect between component parts.



["Flight" *Photograph*

THE SHORT "MUSSEL": Mr. Lankester Parker puts the machine into a vertical bank.

The "Mussel" now gets off in a very short time. When we saw the machine fly last week there was a fairly strong breeze blowing, and the machine leapt off the water in something like 50 or 60 yards, and climbed quite strongly. It appeared to be very manœuvrable, and Mr. Lankester Parker repeatedly flew it in what seemed to be the stalled condition, without the machine evincing any signs of a tendency to drop its nose or go into a spin. In fact, the lateral control appeared very effective even past the stall.

Some of our photographs, published on p. 538, show the machine on the water, and the absence of spray will be noticed. The floats are in fact remarkably "clean," and are well up to the very high standard set in this respect by previous Short float design. Like the fuselage the floats are made entirely of Duralumin, and in this connection it is of interest to refer briefly to another Short machine, the little "Cockle" with two Blackburne "Tomtit" engines. This machine is now three years old, and has been at Felixstowe for tests for a long time. On the day of our visit to Rochester, the machine had just been received back from Felixstowe and the paint had been cleaned off in order to examine the condition of the Duralumin hull. With the exception of about three holes in the region of the rear step, where corrosion had eaten through the plating, the hull appeared to be as good as the day it was built. The corrosion at this particular point is thought to be due to an enclosed step which did not allow of proper ventilation, and by a minor change in design it should be possible to avoid this, when it seems permissible to assume that no corrosion will take place. In view of the very interesting and ambitious work which Short Brothers are now carrying out on very large seaplanes, this fact is important and gives ground for hope that the corrosion "scare" as applied to Duralumin need not be permitted to loom too large in the future. Mr. Oswald Short has held this view for years, and is beginning to be proved correct.

However, to return to the "Mussel," this machine can now definitely be said to be a really practical proposition, and should be of great value as a cheap and economical training machine, as well as a most suitable seaplane for the private owner. It is shortly to be fitted with a land undercarriage, and it will be interesting to see how it then compares for performance with other aeroplanes of approximately the same type and power. Certainly, as a seaplane the "Mussel" is quite a remarkable machine.

The New A.N.E.C. Light 'Plane

Finding that there was apparently some confusion in the minds of those interested in the forthcoming Light 'Plane Competition as to the type of the A.N.E.C. IV machine entered for it, the manufacturers wish to make it clear that it is an entirely new model, a biplane in fact, quite different, therefore, from the monoplanes entered in previous competitions, and have decided to call it by the distinctive name of A.N.E.C. "Missel Thrush," which, appropriately enough, brings in the name of the engine fitted to it.

"Norge I" Sold to Italy

The semi-rigid airship "Norge I," on which Capt. Amundsen made his flight to the North Pole, has been sold to the Italian Government.

SHORT SERVICE COMMISSIONS

THE Air Ministry announces :—Further appointments to short service commissions will be made in September. It is not necessary that every R.A.F. officer should be an engineer, but a practical knowledge of mechanical matters forms a good basis for training future pilots for the Force. The temperament which brings success in games and sports is also one to which flying makes a strong appeal. The Air Ministry therefore specially welcome applications for short service commissions from young men who have had some engineering training or have shown a bent towards mechanical matters in their private amusements, as well as from those who are keen sportsmen and have a leaning towards travel and adventure.

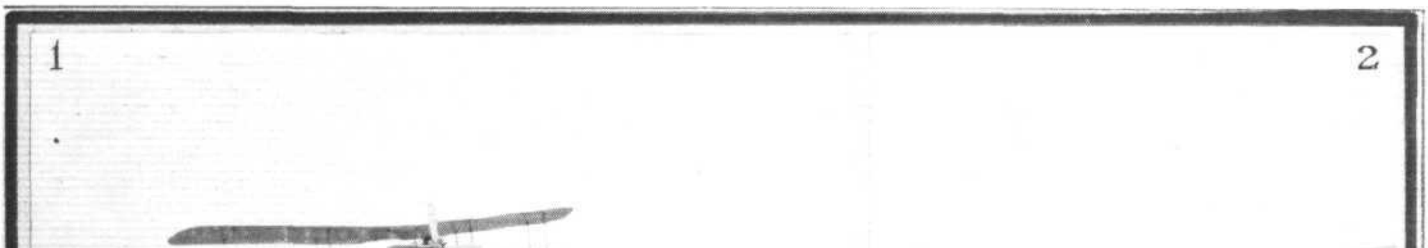
Short service officers on entry are taught to fly and at the same time receive instruction in aeronautical engineering, armament, navigation, etc. On leaving the Flying Training School their further progress in engineering depends largely on their own keenness but they are encouraged to broaden their knowledge by reading and correspondence courses and to increase their practical skill in the squadron workshops. Their service in the R.A.F. counts in part towards the period necessary to become associate members of the Institute of Mechanical Engineers and with the assistance provided they should be able to pass the Associate Membership examination of that institution before they leave the Service.

Only a small number of short service officers can be retained on permanent commissions in the Service, but every year a competitive examination is held in mathematical and scientific subjects and is open to officers of two years' service and under 25 years of age. Those successful in this examination proceed to a two years' specialist course in engineering and are granted permanent commissions. Apart from this examination a small number of short service officers may be permanently retained in the Service on the recommendation of their commanding officers.

The officer who after five years' satisfactory service in the Air Force reverts to civil life will, if he has taken advantage of the facilities provided for him, find himself well qualified to obtain employment in engineering and allied firms. He will leave the service with a gratuity of £375 and will remain in the R.A.F. Reserve where he will keep up his flying.

Applications for forms and regulations should be addressed in writing without delay to the Secretary, Air Ministry, Adastral House, Kingsway, W.C.2. Candidates must be between 18 and 25 years of age, and should have received whole-time education at least up to the age of 16 and possess good physique and eyesight. While the mechanical qualifications described above are important, men not specially qualified in that direction should not be deterred from applying.

Candidates selected will be appointed to commissions as Pilot Officers on probation at a rate of pay of 15*s*. 2*d*. a day, and will either be provided with accommodation, rations, and personal attendance in kind or with cash allowances in lieu amounting at present home rates to about 8*s*. a day. After 18 months' service they will normally attain the rank of Flying Officer, the present pay of which is 18*s*. 10*d*. a day on promotion and 21*s*. 8*d*. a day after two years' service in the rank.



AN AERIAL TOUR IN SCOTLAND : Col. the Master of Sempill carried out yet another aerial holiday from July 29 to August 7 last. This time he flew, with Mrs. Sempill, up in Scotland in Air Commodore J. G. Weir's D.H. 51 (Airdisco). We show above some snaps taken during this tour :—1. The first aeroplane ever to land at John o' Groats ; the D.H. 51 on the edge of the cliff. 2. A tenantry reception given in Col. Sempill's honour at Craigievar Castle. 3. The family butler of Fintray House, Aberdeenshire (Lord Sempill's estate), attended to the stocking of the D.H. 51's larder. 4. Princess Maud, who made her first aeroplane flight, and Lord Carnegie at Elsick House, Aberdeenshire. Col. Sempill covered during his tour approximately 1,600 miles in 18 flying hours.

THE ROYAL AIR FORCE

London Gazette, August 17, 1926

General Duties Branch

The following Flight Cadets, having successfully passed through the R.A.F. Cadet College, Cranwell, are granted permanent commns. as Pilot Officers, with effect from and with seniority of July 30 :—W. L. Freebody, R. K. Hamblin, K. S. Brake, L. C. Bennett, E. S. Finch, H. Waring, J. C. Cunningham, W. G. Abrams, R. F. Part, B. C. Yarde, H. H. Martin, G. Stevinson, C. E. Chilton, R. S. Darbishire, P. H. Jackson, D. N. Roberts, H. A. Purvis, R. P. H. Utley, F. J. Moon.

The following Pilot Officers are promoted to rank of Flying Officer :—C. G. Crowden ; April 15. R. N. T. Gape ; June 30. P. R. Gardner, Earl of Bandon ; June 17. A. H. W. J. Cocks ; June 17. The following Pilot Officers on probation are confirmed in rank :—G. M. Beattie, J. E. A. Binnie, L. S. T. Brown, N. R. Buckle, W. B. Causer, G. R. T. Clarke, A. P. de W. de Wytt, C. E. Eckersley-Maslin, G. H. Godwin, W. E. W. Grieve, H. R. Hawker, J. E. McC. Henderson, H. E. Milton, P. A. Moritz, A. W. H. Nelson, E. G. Olson, J. H. Pool, H. T. A. Silcox, L. M. Timmins, L. S. Tindall, C. Warsow, C. D. G. Welch (Sec. Lieut., H.A.C., Infy., T.A.) ; July 6. C. P. Ashton-Jinks, W. L. Bateman, P. S. Cook, C. H. L. Evans, F. Gower-Jones, V. G. A. Hatcher, C. S. John, H. C. Johnson, C. G. Lucas, D. Mackenzie, A. F. Merritt, D. H. A. C. D. Patton-Bethune, W. M. Phillips, W. J. Pickard, G. A. Underdown ; July 16. R. H. Donkin ; July 22. S. H. C. Gray ; July 23.

Sqdn.-Ldr. A. S. Maskell is restored to full pay from half-pay ; July 30. Flying Officer R. H. Mahon is transferred to Reserve, Class A ; Aug. 16. Flying Officer R. G. Chapell resigns his short service commn. ; Aug. 18. Flying Officer G. D. B. Russell (Lieut., P.W. Vols.) relinquishes his tem. commn. on return to Army duty ; Aug. 16. *Gazette* April 20, 1923, concerning Flying Officer R. V. Weeks is cancelled.

Medical Branch

Flight-Lieut. F. J. Murphy, M.B., is promoted to rank of Squadron-Leader ; Aug. 7. Flight-Lieut. J. A. Musgrave is transferred to Reserve, Class D.2 ; Aug. 17.

Reserve of Air Force Officers

The following are granted commns. in Class A.A., General Duties Branch, as Pilot Officers on probation (Aug. 4) :—I. C. Horton, J. Kennagh. J. D. Dunville, C.B.E., is granted an honorary commn. as a Wing Commander ; Aug. 17. The following Flying Officers are promoted to rank of Flight-Lieutenant (Aug. 17) :—J. E. A. Hoare, D.S.C., A. H. Dalton, G. C. Walker, H. P. Dean.

Flying Officer R. A. Coulthurst is transferred from Class A to Class C ; Aug. 17. Flying Officer J. M. Bell is transferred from Class B to Class C ; Aug. 1. Flying Officer A. G. Lamplugh relinquishes his commn. on completion of service ; June 19. Flying Officer H. S. C. Bassett relinquishes his commn. on account of ill-health, and is permitted to retain his rank ; June 30.

Auxiliary Air Force

General Duties Branch

The following to be Flying Officer :—No. 600 *City of London (Bombing) Squadron*.—A. G. Lamplugh ; Aug. 17. The following to be Pilot Officers :—No. 601 *County of London (Bombing) Squadron*.—R. Bellville ; Aug. 10. J. S. Schreiber ; Aug. 14.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

Pilot Officers : G. M. E. Shaw, to No. 45 Sqdn., Iraq ; 28.4.26. D. C. Sherman, to No. 31 Sqdn., India ; 19.7.26. G. P. Butcher, to Aircraft Depot, India ; 7.7.26. W. S. Townend, to No. 27 Sqdn., India ; 7.7.26. R. C. Whitle, to Aircraft Depot, India ; 7.7.26. The following Pilot Officers are posted on appointment to Permanent Commns. from R.A.F. Cadet College, with effect 30.7.1926 :—W. L. Freebody and F. J. Moon, to No. 11 Sqdn., Netheravon. R. K. Hamblin, to No. 56 Sqdn., Biggin Hill. K. S. Brake and L. C. Bennett, to No. 43 Sqdn., Henlow. E. S. Finch and B. C. Yarde, to No. 3 Sqdn., Upavon. H. Waring, W. G. Abrams, C. E. Chilton and R. S. Darbishire, to R.A.F. Base, Calshot. J. C. Cunningham, to No. 4 Sqdn., Farnborough. R. F. Part, to No. 502 Ulster Sqdn., Aldergrove. H. H. Martin, to No. 2 Sqdn., Manston. G. Stevenson and R. P. H. Utley, to No. 58 Sqdn., Worthy Down. P. H. Jackson and H. A. Purvis, to No. 111 Sqdn., Duxford. D. N. Roberts, to No. 39 Sqdn., Spittlegate.

Stores Branch

Flying Officer : A. Davidson, M.C., to Supply Services, Supply Depot, Mosul ; 11.3.26.

Accountant Branch

Pilot Officers : R. A. J. Mullarkey and A. W. Younghusband, to Sch. of Store Accounting and Storekeeping, Kidbrooke, on appointment to Permanent Commn. (on probation) ; 3.8.26.

Medical Branch

Wing Commander : W. Tyrrell, D.S.O., M.C., M.B., D.P.H., to R.A.F. Depot, Uxbridge, on transfer to Home Estabt. ; 23.7.26.

Flying Officers : L. Freeman, to R.A.F. Depot, Uxbridge ; 5.8.26. J. O. Priestley, D.M.R.E., to R.A.F. Depot, Uxbridge ; 9.8.26. J. Twohill, M.B., to Marine Aircraft Experimental Estab., Felixstowe ; 9.8.26.

The following appointments were made at the Admiralty on August 14 :—

Lieuts. (Flying Officers, R.A.F.) : J. W. Hawkins, to *Victory* and for No. 442 Flight, supy., for final deck landing training. A. Brock, to *Furious* and for No. 420 Flight, supy., for final deck landing training ; 17.8.26. G. R. F. T. Cooper, to R.A.F. Training Base, Leuchars, supy., for training ; 3.8.26.

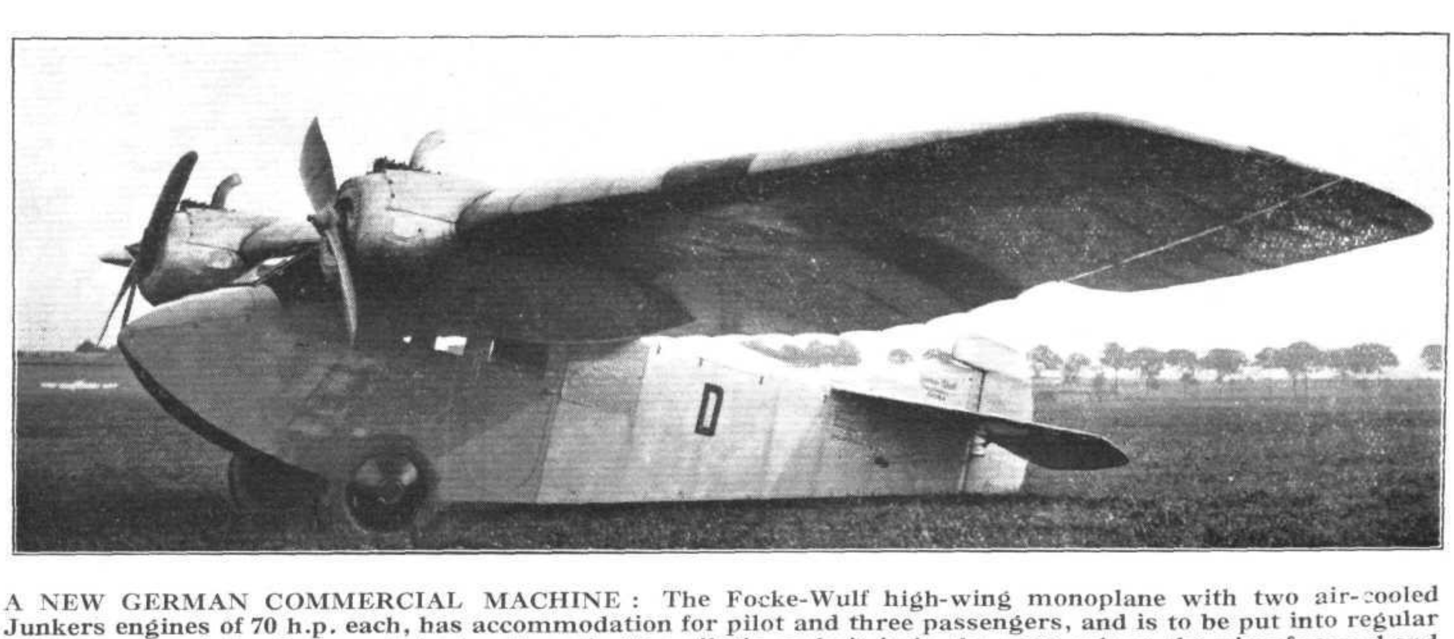
General Duties Branch.

Squadron Leaders : H. P. Lale, D.S.O., D.F.C., to H.Q., Fighting Area, Uxbridge, 7.8.26. R. B. Mansell, O.B.E., to No. 32 Sqdn., Kenley, 3.8.26. W. H. de W. Waller, A.F.C., to No. 1 Schl. of Tech. Training (Apprentices) Halton, on transfer to Home Estab. 26.8.26.

Flight Lieutenants : J. T. Paine, to Station H.Q., Kenley, 1.9.26. B. A. S. Lewin, to R.A.F. Base, Calshot, 1.9.26. R. Young, to H.Q., Coastal Area, 9.8.26. C. T. Anderson, D.F.C., to R.A.F. Base, Calshot, 13.9.36. W. R. Cox, M.C., D.F.C., to H.Q., Spcl. Reserve and Auxiliary Air Force, 16.8.26. E. J. A. Burke to No. 11 Sqdn., Netheravon, 4.8.26. C. D. Palmer to H.Q., Inland Area, Stanmore, 23.8.26. L. J. Riordan, A.F.C., to R.A.F. Depot, Uxbridge, 23.8.26.

Flying Officers : J. St. C. Arbuthnott, to No. 4 Sqdn., Farnborough, 13.8.26. P. N. R. Hallward, to No. 13. Sqdn., Andover, 13.8.26. W. C. Yale, to No. 2. Flying Training Sch., Digby, 1.9.26. C. F. Caunter, to No. 25 Sqdn., Hawkinge, 1.9.26. C. G. C. Sullivan to No. 16 Sqdn., Old Sarum, 1.9.26. J. E. G. Thomas, to R.A.F. Base, Calshot, 1.9.26. T. Sullivan to No. 2 Armoured Car Coy. ; Palestine, 26.7.26. F. Miller to R.A.F. Base, Calshot, 5.8.26. (Hon. Flt.-Lieut.) R. E. B. Rose, to No. 5 Flying Training Sch., Sealand, 9.8.26. (Hon. Flt.-Lieut. R. F. Carter, to R.A.F. Cadet Coll., Cranwell, 26.8.26. E. H. Fielden, to Record Office, Ruislip, 11.8.26. A. P. K. Hattersley, to No. 2 Flying Training Sch., Digby, 4.8.26. R. L. R. Atcherley, to Central Flying Sch., Upavon, 4.8.26. H. E. F. Saunders, to R.A.F. Depot, Uxbridge, 15.6.26. J. W. Lissett, to No. 23 Group, H.Q., Spittlegate, 17.8.26. J. W. Hutchins, to Home Aircraft Depot, Henlow, 18.8.26. C. R. Hancock and G. W. P. Irwin, to No. 20 Sqdn., India, 22.7.26. T. B. Fenwick, to No. 11 Sqdn., Netheravon, 31.8.26.

Pilot Officers : R. W. Holden and J. C. H. Tavendale, to No. 32 Sqdn., Kenley, 13.8.26. N. S. Little and J. W. Bayes, to No. 111 Sqdn., Duxford, 13.8.26. J. C. C. Slater, D. S. E. Vines, A. M. N. David, R. C. H. Monk, E. G. L. Russell, and F. A. Swiss, to R.A.F. Base, Gosport, 13.8.26. E. E. Fallick, C. H. Roberts, T. O'N. East, and C. V. Mossman, to No. 4 Sqdn., Farnborough, 13.8.26. H. T. Andrews and G. Bradbury, to No. 41 Sqdn., Northholt, 13.8.26. L. C. Barling and H. A. Howes, to No. 3 Sqdn., Upavon, 13.8.26. C. S. Horne, W. F. Lovering, C. R. McEvoy, W. H. Shorter and D. G. K. Walker, to No. 2 Sqdn., Manston, 13.8.26. A. W. Shaw to No. 16 Sqdn., Old Sarum, 13.8.26. A. E. Taylor and S. A. Thorn, to No. 17 Sqdn., Hawkinge, 13.8.26. E. M. Thompson and F. B. G. Walker, to No. 56 Sqdn., Biggin Hill, 13.8.26. J. W. M. Nancarrow to No. 31 Sqdn., India, 22.7.26. H. H. V. Tristem, to Armament and Gunnery Sch., Eastchurch, 16.8.26. B. C. Yarde, to No. 43 Sqdn., Henlow, instead of to No. 3 Sqdn., as previously notified. P. H. Jackson and H. A. Purvis, to No. 23 Sqdn., Henlow, instead of to No. 111 Sqdn., as previously notified.



A NEW GERMAN COMMERCIAL MACHINE : The Focke-Wulf high-wing monoplane with two air-cooled Junkers engines of 70 h.p. each, has accommodation for pilot and three passengers, and is to be put into regular use on some of the German "feeder lines." The pilot's cockpit is in the nose, where the view forward and downwards is very good. The windscreen slopes up to the leading edge of the wing.

SOCIETY OF MODEL AERONAUTICAL ENGINEERS

A FLYING meeting was held at Stag Lane Aerodrome on Saturday, August 21, and, considering the adverse wind that was blowing, the models flew extremely well, the following being well worthy of mention :—H. T. Jackson and A. Rasmussen flying fuselage models, G. R. de Havilland flying a twin-pusher type, and B. K. Johnson with a twin-tractor.

The Society has entered three models to take part in the Mulvihill Trophy Competition, to be held at Philadelphia, U.S.A., on September 6. The models were despatched to America on Saturday, August 14. The three entries are :— D. A. Pavely, S. C. Hersom and T. H. Newell. As the competition is one to be decided purely on duration of flight, the three British machines are all of the type 1—1—O—P.

Will members kindly take note of the date of the Model Engineer Exhibition to be held at the Royal Horticultural Hall, Vincent Square, Westminster, from September 17 to 25. The S.M.A.E. will be exhibiting as in future years, and no time should be lost by members in sending in their entry forms.

The two following flying meetings will be held at the Sudbury ground :—

September 4.—General Records.

September 11.—Model Engineer No. 2 Cup for single-screw Farman type models.

B. K. JOHNSON (*Hon. Secretary*)

ROYAL AIR FORCE FLYING ACCIDENTS

THE Air Ministry regrets to announce that as the result of an accident at Dalbandin, Baluchistan, to a Bristol Fighter of No. 20 Squadron on August 15, No. 326349 L.A.C. William Slater Bolam was seriously injured and subsequently died. Wing-Commander John Oliver Archer, C.B.E., the pilot of the aircraft, sustained injury to the spine.

As the result of an accident at Camberley, Surrey, to a Bristol Fighter of No. 13 Squadron, Odiham, Hampshire, on August 16, Flying Officer Theodore Harold James Wright, the pilot of the aircraft, was killed and Lieutenant William Lewis Roberts, M.C., Middlesex Regiment, was slightly injured.

As the result of an accident at Brook Down, Isle of Wight, to a Blackburn Dart of the Royal Air Force Base, Gosport, on August 17, John Leslie Llewellyn Rees, Lieutenant, Royal Marines, Flying Officer, Royal Air Force, the pilot and sole occupant of the aircraft, was killed.

Cross Channel Air Service Disaster

IT is with regret that we have to report a serious accident, resulting in three deaths, to a 4-engined Bleriot 155 of the Air Union during a flight from Paris to London on August 18. Weather conditions at the time of the accident were unfavourable, visibility being very poor, and it appears that the pilot, De Lisle, had trouble with one of the engines on reaching the English coast. In attempting to land in a field near Hurst (just outside Lympne) the undercarriage struck the roof of a barn, and then the machine collided with some stacks, swerved completely round, and crashed into the ground. Fortunately the machine did not catch fire, and when the owner of the farm and others rushed to render assistance, three of the passengers climbed out of the wreckage, not very seriously injured. The pilot and mechanic were found lying very seriously injured in the nose, whilst the other passengers lay huddled together in the fore part of the cabin, two being dead. In all there were 13 passengers, 11 being injured. Ambulances, which arrived shortly after, removed the injured to Folkestone Hospital, where the pilot died the following day. The mechanic, M. Gavin Ducos, is stated to be in a critical condition. The names of the two passengers killed are: Mr. Hugo Rizzi, Manager of Ambassador's Club, and Mr. Robert Blaney, of Boston, U.S.A.

Sir Samuel Hoare sent the following telegram to the Air Union in connection with this accident: "Deeply grieved to learn of serious casualties which occurred in most regrettable accident to one of your machines yesterday. Please convey expression of my profound sympathy to relatives of those killed. I trust injured are making satisfactory progress. —SAMUEL HOARE, Secretary of State for Air."

Transatlantic Sikorsky's Successful Trial

THE three-engined ("Jupiter") Sikorsky S.35 biplane, on which Capt. René Fonck will attempt to fly from New York to Paris, made its first flight at Roosevelt Field on August 23. The flight was quite successful, and carrying a load of 12,000 lb. it attained a speed of 130 m.p.h.

SIDEWINDS

ANOTHER triumph for "K.L.G." plugs! We hear that Capt. Girier used "K.L.G." plugs when he made his recent record-breaking non-stop flight of 2,940 miles on the Hispano-engined Breguet. Writing to the Robinhood Engineering Works, Ltd.—the makers of "K.L.G." plugs—Capt. Girier says :—"I have pleasure in informing you that during my record flight from Paris to Omsk, and for the return journey, 'K.L.G.' plugs were fitted in my Hispano engine. The same set of plugs carried on throughout the journey without the slightest trouble."

WE learn from Messrs. Godbolds, Ltd., that after residing 17 years at 8, Bream's Buildings, London, E.C.4, they have had to move to larger premises, and are now located at 1, Clement's Inn, Strand, W.C.2. Their telephone number remains as before—Holborn 2818.

"BP." WAS the moving Spirit in the two big events at the recent Bournemouth Aviation Meeting. In the Boscombe High Power Handicap, Mr. A. S. Butler, who came in first on the D.H. 37, and in the 20-mile Bournemouth Summer Handicap, Mr. D. A. N. Watt, who was first on the "Swallow," both used "BP."

PUBLICATIONS RECEIVED

Reports of the U.S. National Advisory Committee for Aeronautics: *No.* 226.—Characteristics of a Boat-Type Seaplane During Take-Off. By J. W. Crowley and K. M. Ronan. *No.* 229.—Pressure Distribution Over Thick Tapered Airfoils, N.A.C.A. 81, U.S.A. 27 C, Modified, and U.S.A. 35. By E. G. Reid. *No.* 233.—The Aerodynamic Characteristics of Seven Frequently Used Wing Sections at Full Reynolds Number. By Max M. Munk and E. W. Miller. *No.* 234.—Three Methods of Calculating Range and Endurance of Airplanes. By W. S. Diehl. *No.* 236.—Tests on Airplane Fuselages, Floats and Hulls. By W. S. Diehl. *No.* 238.—The Effect of Flight Path Inclination on Airplane Velocity. By W. S. Diehl. *No.* 245.—Meteorological Conditions Along Airways. By W. R. Gregg. The National Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1925

Published August 19, 1926

2,332. R. H. UPSON. Airships. (228,201.)
7,829. AIRCRAFT DEVELOPMENT CORPORATION. Aircraft-mooring stations. (255,510.)
16,058. G. M. BALL, and L. L. IRVIN. Parachute pack constructions. (255,609.)
17,018. BLACKBURN AEROPLANE & MOTOR CO., LTD., and A. E. MILLS. Control-gear for aircraft. (255,619.)

APPLIED FOR IN 1926

Published August 19, 1926.

3,278. SPERRY GYROSCOPE CO. Gyroscopic compasses. (255,745.)
3,386. A. VON PARSEVAL. Air-propeller with freely oscillatable blades. (247,938.)
8,623. F. GEBAUER AND DANUVIA IPARIES KERESKEDELMI R.T. Machine guns for use on flying-machines. (250,233.)

Correction.—By an error the list of patent specifications appearing in last week's issue was given as "published August 19, 1926." This should have read "Published August 26, 1926."

FLIGHT

The Aircraft Engineer and Airships

36, GREAT QUEEN STREET, KINGSWAY, W.C.2.

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